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Devoted to Textile Chemistry
BLEACHING • DYEING • PRINTING • FINISHING

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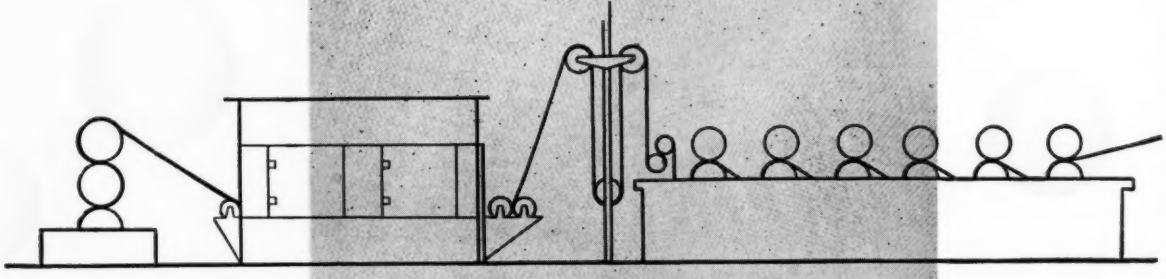

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COMPARISON OF THE SULFURIC ACID AND SODIUM HYDROXIDE METHODS FOR THE ANALYSIS OF WOOL ADMIXED WITH COTTON AND VISCOSE RAYON

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U S Dept of Commerce, Washington 25, D C

In the manufacture of blankets consisting of mixtures of wool, cotton and viscose rayon it is necessary to determine the percentage of wool. This study compares the sulfuric acid and sodium hydroxide methods with respect to their suitability for the analysis of low concentrations of wool in the presence of other fibers. From analyses on known samples of fiber mixtures, the standard deviation is calculated to be 0.28 percent wool for the acid method and 0.37 percent wool for the alkali method. The relative merits of each method are discussed.

INTRODUCTION

THE acid and alkali methods for the chemical analysis of wool are widely used in analytical laboratories for the quantitative determination of wool content *(1)*. The analyst is faced with the problem of selecting a procedure which will yield accurate results and which can be handled efficiently. In the alkali method the wool fibers are dissolved in 5 percent sodium hydroxide, the nonwool fibers are determined, and the wool content is obtained by difference. In the acid method the cotton and viscose rayon fibers are dissolved and the wool fibers are determined directly. The present work involves a study of both methods in an experiment designed to evaluate their precision and accuracy when dealing with concentrations of wool between 5 and 25 percent.

PROCEDURE

The fibers of Rambouillet wool, viscose rayon and cotton used in this study were purified, oven-dried to constant weight at 105° C and stored in separate sealed containers. Two-gram samples were prepared from these fibers to conform approximately to the scheme shown in Table I by accurately weighing portions of the individual fibers. The slight moisture gain during the weighing process was determined on separate samples of the individual fibers of Rambouillet wool, viscose rayon and cotton. The wool content of the standard samples was then calculated on the basis of oven-dried weights.

The wool was obtained from the US Department of Agriculture, Beltsville, Md, and microscopic examination showed no significant biological or mechanical damage. The cotton was in the form of bleached and unmercerized yarn, and the fibers of viscose rayon were of the continuous filament, lustrous type[1].

TABLE I
COMPOSITION ON A PERCENTAGE BASIS

Sample	*Rambouillet Wool*	*Viscose Rayon*	*Cotton*
5A	5.0	—	95.0
5B	5.0	47.5	47.5
10A	10.0	—	90.0
10B	10.0	45.0	45.0
15A	15.0	—	85.0
15B	15.0	42.5	42.5
25A	25.0	—	75.0
25B	25.0	37.5	37.5

A preliminary experiment showed no apparent loss in weight of wool during analysis by the acid method. In the alkali method, the cotton and a mixture of cotton and viscose rayon were soluble to the extent of 3.0 and 4.0 percent, respectively. These values were in agreement with those reported in the literature *(2)*, and were used in the analyses as correction factors.

[1] Both samples were obtained from Chatham Manufacturing Company, Elkin, N C.

SULFURIC ACID METHOD ——— Each sample was immersed in 200 ml of a boiling 1 percent solution by weight of sulfuric acid for 10 minutes. Forceps were then used to transfer enough of the sample to the bottom of a Coors No. 3 Gooch crucible to form a pad, and the remaining fibers were quantitatively collected by filtration. The sample was then immersed in 200 ml of a 70 percent solution by weight of sulfuric acid at 37.7° C (100° F) and stirred mechanically for 15 minutes. The wool residue was collected as described above and washed thoroughly with water. (A sintered glass crucible was not used because the pores became clogged and filtration was long and tedious.) With a Gooch crucible the filtration, using suction, could be completed in 2 minutes. The fibers were then immersed in a 2 percent solution of sodium bicarbonate at room temperature for 5 minutes after which they were again collected and washed. Finally the fibers were dried to constant weight in an air oven at 105° to 110° C (220° to 230° F). The wool content was calculated on a moisture-free basis.

SODIUM HYDROXIDE METHOD ———Each sample was immersed in a beaker containing 200 ml of a boiling 5 percent aqueous solution by weight of sodium hydroxide for 10 minutes. The nonwool residue was collected in a Coors No. 3 Gooch crucible and washed with 1 liter of hot water. The fibers were then washed with 100 ml of 5 percent acetic acid followed by 500 ml of hot water and dried to constant weight as in the acid method. The wool content was calculated on the basis of oven-dried weights.

TABLE II

GENERAL DESIGN USED IN EACH METHOD OF ANALYSIS

Group	Order			
	1	*2*	*3*	*4*
I	{ 10A	25A	15A	5A
	{ 10B	25B	15B	5B
II	{ 25B	10B	5B	15B
	{ 25A	10A	5A	15A
III	{ 15A	5A	10A	25A
	{ 15B	5B	10B	25B
IV	{ 5B	15B	25B	10B
	{ 5A	15A	25A	10A

EXPERIMENTAL DESIGN

The study was conducted according to the statistical plan outlined in Table II. This plan, which is essentially a latin square arrangement *(3)*, aims to achieve the following results:

1) An estimation of the reproducibility of each method, both for analyses made concurrently and for analyses made at different times.

2) The detection and evaluation of systematic errors that may be present in either method.

Each group was treated as a unit and the samples in a particular group were prepared and analyzed by both methods during a 24-hour period. For example, the eight samples shown under Group I were prepared in sequence for analysis by the alkali method and then eight additional samples were prepared for analysis by the acid method. The first set was analyzed in the order listed by the sodium hydroxide method, and the second set, by the sulfuric acid method. This procedure was used in all the remaining groups. A total of 64 determinations was made, which included 32 analyses by each method.

The results of the analyses by the alkali and acid methods are presented in Table III and Table IV. The average values for the difference between the actual and the experimental percent of wool are listed in Table V.

In the statistical analysis of the data, attention was centered on the following factors affecting precision and accuracy:

1) Reproducibility of results for samples prepared and analyzed the same day (intrinsic precision).

2) Reproducibility of results for samples prepared and analyzed on different days (over all precision).

3) Systematic errors (accuracy).

The breakdown of errors according to 1 and 2 is mainly of theoretical interest; the practical evaluation of the methods of analysis should, in general, be based on 2.

Regarding systematic errors, a pertinent question is whether they are "absolute", i e, of the same order of magnitude for samples of widely different wool content; or "relative", i e, proportional, in the order of magnitude, to the wool content of the sample.

The results of the statistical analysis are summarized in Table VI.

TABLE III

THE ANALYSIS OF WOOL BY THE ALKALI METHOD

		Percentage of Wool		
	Sample	*Actual*	*Experimental*	*Difference*
Group I				
	5A	5.2	4.5	—0.7
	10A	10.8	10.1	—0.7
	15A	17.0	16.9	—0.1
	25A	26.5	26.0	—0.5
	5B	5.2	5.2	0.0
	10B	11.2	11.2	0.0
	15B	15.9	16.4	+0.5
	25B	24.3	24.6	+0.3
Group II				
	5A	6.3	5.9	—0.4
	10A	11.1	10.9	—0.2
	15A	15.9	14.8	—1.1
	25A	24.4	23.7	—0.7
	5B	7.2	7.0	—0.2
	10B	10.0	9.4	—0.6
	15B	14.8	14.7	—0.1
	25B	25.7	25.0	—0.7
Group III				
	5A	5.2	4.4	—0.8
	10A	9.9	9.5	—0.4
	15A	13.9	12.7	—1.2
	25A	24.2	23.8	—0.4
	5B	4.6	4.4	—0.2
	10B	10.4	10.4	0.0
	15B	14.5	14.4	—0.1
	25B	25.1	25.3	+0.2
Group IV				
	5A	5.0	4.1	—0.9
	10A	11.2	10.7	—0.5
	15A	16.2	15.6	—0.6
	25A	26.4	25.7	—0.7
	5B	5.1	4.8	—0.3
	10B	9.5	9.7	+0.2
	15B	13.1	13.5	+0.4
	25B	25.2	25.2	0.0

TABLE IV

THE ANALYSIS OF WOOL BY THE ACID METHOD

		Percentage of Wool		
	Sample	*Actual*	*Experimental*	*Difference*
Group I				
	5A	5.9	5.9	0.0
	10A	9.5	9.4	—0.1
	15A	18.2	18.4	+0.2
	25A	24.9	25.0	+0.1
	5B	5.9	5.7	—0.2
	10B	9.8	9.7	—0.1
	15B	14.8	14.6	—0.2
	25B	23.8	24.0	+0.2
Group II				
	5A	6.5	6.8	+0.3
	10A	10.1	10.3	+0.2
	15A	15.3	15.8	+0.5
	25A	25.7	26.4	+0.7
	5B	5.6	5.8	+0.2
	10B	10.8	11.2	+0.4
	15B	16.6	17.3	+0.7
	25B	26.7	27.2	+0.5
Group III				
	5A	5.2	5.1	—0.1
	10A	9.0	9.2	+0.2
	15A	15.6	16.1	+0.5
	25A	25.3	25.7	+0.4
	5B	5.9	6.0	+0.1
	10B	9.4	9.4	0.0
	15B	15.3	15.6	+0.3
	25B	25.7	26.0	+0.3
Group IV				
	5A	5.7	5.8	+0.1
	10A	10.2	10.4	+0.2
	15A	14.9	15.2	+0.3
	25A	24.9	25.3	+0.4
	5B	6.5	6.5	0.0
	10B	10.9	11.0	+0.1
	15B	14.1	14.2	+0.1
	25B	24.6	24.7	+0.1

DISCUSSION

It can be shown on the basis of Table VI that, by combining the effects of the random and systematic errors, a single determination of wool content by either method will yield a result within 1 percent of wool when present in concentrations from 5 to 25 percent in mixtures of cotton and viscose rayon.

The results obtained by the alkali method were, on the average, low by 0.6 percent wool in wool and cotton mixtures and by 0.1 percent wool in mixtures of wool, cotton and viscose rayon. In both cases the difference between the experimental and actual values was absolute and was not dependent upon the amount of wool present. Consequently, the error would be more significant in low concentrations of wool and relatively less significant as the concentration of wool increased.

The results obtained by the acid method

TABLE V

DIFFERENCE BETWEEN TRUE AND EXPERIMENTAL VALUES FOR PERCENT WOOL (AVERAGE OF FOUR DETERMINATIONS)

Sample	Alkali Method	Acid Method
5A	—0.7	+0.1
10A	—0.5	+0.1
15A	—0.8	+0.4
25A	—0.6	+0.4
5B	—0.2	0.0
10B	—0.1	+0.1
15B	+0.2	+0.2
25B	—0.1	+0.3

TABLE VI

EVALUATION OF EXPERIMENTAL DATA

Method	Precision Standard Deviation		Accuracy	
	Intrinsic	Overall	Nature of Systematic Error	Systematic Error
sulfuric acid	0.12% wool	0.28% wool	relative	+1.7% of wool content[a] +1.0% of wool content[b]
sodium hydroxide	0.26% wool	0.37% wool	absolute	—0.6% wool[a] —0.1% wool[b]

[a] for mixtures of wool and cotton
[b] for mixtures of wool, cotton and viscose rayon

of wool content for wool and cotton mixtures and 1.0 percent of wool content for wool, cotton and viscose rayon mixtures. In this instance there was a positive relative error, which was dependent upon the amount of wool present. The high values were probably due to traces of sulfuric acid which were retained in the wool residue. Ryberg *(4)*, and Mease and Jessup *(5)*, have found sulfates present in samples of wool analyzed by the sulfuric acid method. Several mechanisms by which the acid may be taken up and held have been reported *(6)*. Accordingly, the larger the wool residue the greater is the amount of acid retained by the fibers.

Both methods require the removal of nonfibrous substances since finishing materials may seriously affect the accuracy of the results. Howlett, Morley and Urquhart *(7)* report that certain constituents used in the finishing process may render insoluble those fibers which might otherwise dissolve. Furthermore, if these substances are not quantitatively removed prior to analysis by the sodium hydroxide method, their loss during the determination will yield high values for the wool content.

If the wool content of the finished material is required, the alkali method consumes more time than the acid method since the weight of the desized specimen must be determined in order to calculate the amount of wool dissolved during the treatment with sodium hydroxide. This quantitative determination is not necessary in the acid method because wool is determined directly. When the wool content of the fiber mixture is required, the weight of the desized specimen must be determined in both methods.

More time is required to dissolve the fibers by the acid method, which is also more sensitive to temperature, time in solution, mechanical agitation and concentration. On the other hand the acid method is slightly superior in precision to the alkali method.

A 2-gram sample can be used in either method without seriously affecting the analysis. Data from previous work involving a 3-gram sample showed very nearly the same standard deviation. The use of a smaller sample has certain obvious advantages.

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● ABSTRACTS ●

New Ideas for Crease- and Shrink-Resist Finishing Processes

B C M Dorset, *Textile Mfr* 80, 199-203, April, 1954.

In a recent patent specification, the following objections to the usual urea- or melamine-formaldehyde crease-resist process are listed:

(1) The finish is washed out on repeated laundering.
(2) The cotton or rayon fabric often acquires a stiff hand.
(3) The fabric may retain chlorine from the bleaching liquors used in laundering.
(4) There is a loss of abrasion resistance.
(5) There is frequently a change of shade or a reduction in light fastness.
(6) The process requires special equipment.
(7) Free formaldehyde, liberated in the process, is objectionable.
(8) The finish may cause dermatitis with certain persons.
(9) The fabric is liable to have a fishy odor.

According to BP 703,432, if certain complex compounds or urea with metal salts are used instead of urea itself, high curing temperatures can be avoided, and acid-liberating catalysts are unnecessary. Drying of the impregnated fabric on a tenter frame at 90-100°C is sufficient. Improved penetration, a softer hand, freedom from odor, and good crease-resistance are claimed for the process. It is also possible to add a wax-aluminum emulsion to the liquor so as to obtain water-repellency at the same time.

According to BP 695,703, the original Tootal process for proofing cotton or viscose with urea- or melamine-formaldehyde resin may be modified by the addition of a silicone, thus obtaining water-repellency as well as crease resistance.

The usual method of crease-proofing involves curing in a substantially dry atmosphere at 130-150°C. According to BP 704,143, the cellulose fiber so treated usually suffers a loss of resistance to abrasion. It is claimed that by substituting a hot moist atmosphere containing formaldehyde or acid, the loss in abrasion resistance is only slight. Superheated steam with high moisture content is said to be suitable for this purpose.

Two new resins, monomethylol dimethyl hydantoin and dimethyl hydantoin formaldehyde, are suggested in BP 689,102 as useful substitutes for formaldehyde in anticrease and shrink-resistant processes. The treated fabric is said to retain its original strength, color, softness, and abrasion resistance, and the finish withstands repeated washing at the boil.

BP 696,282 refers to the use of an epichlorhydrin to give cotton and viscose rayon fabrics dimensional stability. It is said to react with the cellulose to form cross-linkages.

In BP 637,656 it is claimed that if a viscose rayon fabric is padded with a concentrated caustic soda solution, skyed for a few seconds, and rapidly neutralized with acid, the finished fabric shows no tendency to shrink in washing.

All of the above processes are described in considerable detail.—WHC

Tar Spot Removal from Cotton Fabrics During Finishing

J Compton and L R Hubbard, *Textile Research J* 24, 578-83, June, 1954.

Tar and asphalt contamination of finished cotton fabrics has plagued the cotton industry for many years. With the introduction of new finishes for cotton in recent years, such as embossing, polishing, glazing, and schreinering, the problem is now recognized as being quite serious. When minute tar or asphalt particles in the cloth are hot-calendered, they appear either as large black spots or as long black streaks.

The work of the National Cotton Council indicates that 90 percent of the tar and asphalt particles responsible for tar spots in finished goods are located on the outside of the cotton bale, indicating that the bales become contaminated during transportation and storage. Various sources of this contamination are suggested.

Tar spots in finished cotton goods may be removed after finishing by the use of spotting techniques, and during finishing operations by the use of special additives and processes. The former procedure is the more expensive, but often must be resorted to in order to prevent excessive fabric grading losses.

The authors describe several spotting techniques developed at the Institute of Textile Technology: (a) steam spotting—application of a tar solvent, followed by steaming; (b) water spotting—application of a tar solvent followed by water (fabric placed over an absorbent pad during the application); (c) dry solvent spotting—application of a tar solvent followed by application of a second miscible organic solvent to the fabric placed over an absorbent pad.

Tar spots can also be removed by a pressure kier boil. The authors recommend, for four tons of cloth, besides the usual caustic soda, the addition of 18 gallons of sulfonated oil and 50 gallons of xylene. It is claimed that this treatment will remove about 85 percent of the spots; if followed by a hot wash, the removal will be close to 95 percent. Similar results are said to be obtained with a combination of pine oil, sulfonated oil, and xylene.

A continuous method is also described, in which the cloth is treated directly after singeing. The quench box is filled with 0.5 percent caustic soda at 150-160°F, and a layer of a mixture of 1 part pine oil and 9 parts kerosene is run onto the surface of this liquor. The pine oil-kerosene mixture is fed continuously during the run. The cloth is run into a bin for 4 hours and is washed continuously with water at 160-180°F. It is stated that under proper conditions at least 95 percent of the tar spots can be removed by this treatment, and possibly 100 percent if it is followed by a soap wash.

It is pointed out that both the kier and the quench box procedures are also quite effective in removing warp sizing from the cloth, as well as tar and asphalt. —WHC.

The Crease-Resist Finish

H W Best-Gordon, *Dyer* 111, 825, 827, May 28, 1954.

The crease-resist finishing of rayon staple fabrics is a process more and more widely demanded by the trade and carried out on an increasing scale by fabric finishers. In spite of the extensive experience now gained both of the suitability of the finish for fabric end-use and the technology of its application, the standard of quality attained in finished goods is often regrettably low.

The essential steps for the production of a well-finished crease-resist fabric are as follows:

The formaldehyde-base precondensate should be completely soluble in water. After the addition of catalyst, the solution should remain clear long enough for fabric impregnation to take place. The solution of precondensate is then absorbed by the fabric and the resin is formed very largely *inside* the water-swollen fibers, which is an essential feature for conferring resistance to creasing.

The use of an insoluble or partly soluble precondensate will result in the deposition of resin *on the surface* and within the thread-interstices of the fabric. This results in two properties in the finished fabric: a firm hand and lowered resistance to abrasion.

Padding in the precondensate solution should be absolutely even across the width and along the run.

Drying should take place, as a continuous process, immediately after impregnation at the pad. There is no substitute for a tenter frame. Furthermore, drying should be uniform across the fabric width.

Final condensation of the resin to the stage of the high polymer, which alone can confer resistance to crease and a stable finsh, must be carried out in a polymerizer capable of raising the temperature of the fabric to 120-145°C for a few minutes. The precise temperature depends upon the catalyst used and the rate of movement of the cloth through the machine.

Any serious over-polymerization can lead to embrittlement of the fabric; it may be caused by a too long exposure to polymerizing temperatures or by the use of excess acid catalysts.

Washing after polymerization is a vital step, the omission of which can render pointless all the care and control put into the previous processes.

Properly carried out, the application of urea-formaldehyde-type resins produces in spun rayon fabrics a greatly enhanced resistance to creasing, greater dimensional stability, a crisp hand and a high color fastness, with incidental weighting of the fabrics.

There are no short cuts to successful crease-resisting: it is a chemical process demanding skill, control and adequate plant.—WHC.

Nylon in Socks: Relative Merits of Different Constructions

Anon, *British Rayon & Silk J* 30, 47, May, 1954.

Many retailers have commented that their customers are somewhat confused as to the relative merits of the different types of socks containing nylon. Nearly all light and medium weight socks now contain some nylon, the content varying from 100 percent nylon constructions to the limited use of nylon for splicing yarns in heels and toes only.

The properties of nylon which are of particular value in socks are its exceptional abrasion resistance and its dimensional stability in wear and washing. The following notes have been widely circulated by British Nylon Spinners in the interests of all concerned.

The splicing of heel and toe sections only with nylon very greatly increases the life of two of the three vital points of wear in the sock. The third point, just above the heel, remains unprotected. In this type of sock the splicing yarns should be 100 percent nylon for an appreciable and noticeable increase in wear life at these two points.

In a high spliced sock the splicing yarn is introduced about 1½ to 2 in above the heel pouch. Again the splicing yarn should be 100 percent nylon. Then the three vital points will be adequately protected. Providing the rest of the sock is reasonably dimensionally stable, most wearers find this type of sock improves the wear life by 50 to 100 percent.

There are two main types of nylon blended socks (usually nylon-wool blends): those containing 15-25 percent of nylon, and those containing 50 percent of nylon. General experience indicates that socks of a 25:75 nylon/wool blend last well over twice as long as an all-wool counterpart. Socks of a 50:50 blend give even greater wear life. The appearance, hand, comfort, and dimensional stability are said to be exceptionally good.

The 100 percent nylon socks may be constructed of plain filament yarns, crimped filament yarns, or spun yarns. The first type is most commonly supplied in black

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Program for Perkin Centennial Completed

RAYMOND W JACOBY, chairman of the Executive Committee for the Perkin Centennial, has announced the completion of the program for the event, which will be held at the Waldorf-Astoria Hotel, New York, N Y, during the week of September 10, 1956.

Topics and sponsoring societies will be as follows:

SIR WILLIAM H PERKIN — HIS LIFE AND HIS WORK
The Society of Dyers and Colourists

THE HISTORY OF COLOR
American Association for the Advancement of Science

THE HISTORY OF DYEING
American Association of Textile Chemists and Colorists

THE PHYSICS OF COLOR
Optical Society of America
Inter-Society Color Council

THE CHEMISTRY OF SYNTHETIC DYES
American Chemical Society

THE MANUFACTURE OF SYNTHETIC DYES
Synthetic Organic Chemical Manufacturers Association
Manufacturing Chemists Association

THE PSYCHOLOGY OF COLOR
American Psychological Association
Inter-Society Color Council

THE IMPACT OF COLOR ON OUR ECONOMY
THE IMPACT OF SYNTHETIC DYES ON OUR ECONOMY
U S Department of Commerce

COLOR IN INDUSTRY
Inter-Society Color Council

COLOR IN THE WORLD OF FASHION
National Retail Dry Goods Association

COLOR IN NATIONAL DEFENSE
U S Department of Defense
(National Research Council Advisory Committee)

SERVICEABILITY OF DYED MATERIAL
American Association of Textile Chemists and Colorists
American Society for Testing Materials

THEORIES OF DYEING
Textile Research Institute

PIGMENTS AND COLOR LAKES
Dry Color Manufacturers Association
National Paint, Varnish, and Lacquer Association

THE APPLICATION OF COLORANTS TO TEXTILES
American Association of Textile Chemists and Colorists
Canadian Association of Textile Colourists and Chemists

THE APPLICATION OF COLORANTS TO PAPER
Technical Association of the Pulp and Paper Industry

THE APPLICATION OF COLORANTS TO LEATHER
The American Leather Chemists Association

THE APPLICATION OF COLORANTS TO PLASTICS
The Society of the Plastics Industry

THE APPLICATION OF COLORANTS TO FOOD
Institute of Food Technologists

THE APPLICATION OF COLORANTS TO DRUGS
American Pharmaceutical Association

THE APPLICATION OF COLORANTS TO COSMETICS
Society of Cosmetic Chemists

PRESENTATION OF THE PERKIN MEDAL
American Section of the Society of Chemical Industry in conjunction with:
American Chemical Society
American Institute of Chemical Engineers
Electrochemical Society
American Section of the Societe de Chimie Industrielle

AATCC CALENDAR

(A general calendar of events may be found on page 644)

COUNCIL
1955—Jan 21, Apr 15, June 17
1954—Sept 15, Nov 19.

NATIONAL CONVENTIONS
Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J; 1956 (New York; 1957 (Boston).

NEW YORK SECTION
October 15, November 19 (Kohler's Swiss Chalet, Rochelle Park, N J); January 28 (Georgian Room, Hotel Statler, New York); February 25 (Skytop, Hotel Statler, New York); March 18, April 22, May 20 (Kohler's Swiss Chalet, Rochelle Park, N J).

NORTHERN NEW ENGLAND SECTION
Oct 8 (Colonial C C, Lynnfield, Mass); Dec 10 (Woodland Golf Club, Auburndale, Mass).

PACIFIC SOUTHWEST SECTION
Oct 30 (Outing—Ojai, Calif)

PIEDMONT SECTION
Oct 16 (Hotel Barringer, Charlotte, N C).

PHILADELPHIA SECTION
Sept 24, Oct 29 (Penn-Sherwood Hotel, Philadelphia, Pa); Dec 3 (Kugler's Restaurant, Philadelphia).

RHODE ISLAND SECTION
Oct 14 (Johnson's Dummocks Grille, Providence, R I); Dec 2 (Annual Meeting—Sheraton Biltmore, Providence, R I).

SOUTH CENTRAL SECTION
Dec 4 (Hotel Patten, Chattanooga).

SOUTHEASTERN SECTION
Dec 11 (Atlanta-Biltmore, Atlanta, Ga).

WESTERN NEW ENGLAND SECTION
Oct 1, Nov 12, Dec 10 (Rapp's Restaurant, Shelton, Conn).

WESTERN NEW YORK SECTION
Oct 8 (Buffalo, N Y); Nov 27 (Hamilton, Ont); Jan 14 (Buffalo); Mar 4 (Hamilton, Ont); April 22 (Buffalo); June 24 (Outing)

NOTICE TO SECRETARIES AND PUBLICITY CHAIRMEN OF LOCAL SECTIONS

Papers presented before local sections should be sent to Dr Carl Z Draves, Editor of the *Proceedings*, 30 Lahey Street, New Hyde Park, New York. Authors should provide two copies for this purpose.

Reports of local section meetings should be sent to the American Dyestuff Reporter with copies going to Dr H C Chapin, National Secretary.

Dates of meetings and advance notices of meetings should be sent to the American Dyestuff Reporter with copies also going to Dr Chapin. For publication in any particular issue, information should be in the office of the Reporter 17 days before the issuance date.

Contribution——

DETERGENT EFFICIENCY——INTERPRETATION OF REFLECTANCE CURVES

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Wilmington, Del

A method is described for obtaining, directly from reflectance data, the relative efficiencies of detergents for removing soil. The related problems of redeposition and soil suspending power are not covered in this paper. The method is based on the difference in mechanical work required to give the same results with various detergents when all other washing conditions are held constant. As corollaries, the relative efficiencies of washing machines and the effect of temperature, water hardness and detergent builders may also be quickly obtained from reflectance data. The method should be applicable to tests involving any artificially soiled fabric, provided soil removal is measurable by reflectance changes and a combination of detergent action and mechanical action is required to remove the soil. The formula for calculating the relative efficiencies of washing processes is

$$\text{Relative Efficiency} = \text{Antilog}\ \frac{R_2 - R_1}{33.2\ b}$$

where R_2 and R_1 are two reflectivity readings relative to MgO, and b is a constant obtainable by experiment with a soiled fabric. The number 33.2 is a fundamental constant, which relates to the reflectivity and soil content of a fabric.

INTRODUCTION

THIS paper relates to the quantitative evaluation of the relative efficiency of washing processes from reflectance data obtained by washing artificially soiled fabrics. In earlier work, Bacon and Smith *(1)* established that there is a quantitative relationship between detergent action and mechanical action in removing water insoluble soils in a washing process. They showed that, where increased detergent concentration or increased mechanical action is accompanied by increased soil removal, the concentration of detergent required is inversely proportional to the work done by the washing machine when the degree of soil removal and temperature are constant. This relationship is expressed by the equation

$$CW = k \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where C is the concentration of detergent and W the effective mechanical work.

The quantitative evaluation of soil removal by detergents and mechanical action *directly* from reflectance-concentration curves obtained by washing artificially soiled fabrics has always been at points of equal reflectance. The use of Equation 1 is not generally practiced because of the large amount of experimental work usually required in varying the mechanical work to compensate for other variables to obtain points of equal reflectance.

It is the purpose of this paper to establish relationship between reflectance changes and mechanical action in detergent processes so that the relative efficiencies of washing operations can be readily determined.

The efficiency of a washing operation is affected by (a) the quality and temperature of the washing medium, and (b) by the quantity of work applied by the machine. The quality of the washing medium depends upon the type and quantity of detergent used, including so-called builders for detergents, and water hardness.

Since we shall only deal with systems where mechanical action is needed to remove the soil, the relative efficiencies of detergents will be measurable in terms of mechanical work. As a corollary, the relative efficiencies of washing machines can be measured. In cases where mechanical action is not required, it is merely necessary to study the quality of the bath required to remove the soil in a simple immersion and rinsing process.

This study relates specifically to the removal of soils and does not relate to the assessment of the activity of the detergent in preventing redeposition of the soil removed or to soil suspending power. It is recognized that a complete evaluation of a detergent requires the assessment of all three of these factors. The test method employed was described by Bacon *(4)* and employs lampblack as a pigment incorporated in a mineral oil and a hydrogenated fat. This test method was used by Bacon and Smith *(1)* in establishing the relationship between mechanical action and detergent concentration in the washing process. We have evidence that other soiled fabrics can be used in the same manner, provided they meet the following criteria:

1) The measured soil must be removable only by a combination of detergent action and mechanical action.

2) The soil must be a single type unless the mixed soils are removed at the same rate or measured separately.

It is essential in carrying out experiments on soil removal to use conditions which do not permit measurable redeposition.

EXPERIMENTAL

It is proposed in this paper to establish a method for comparing the relative efficiency of detergents for removing soil by relating differences in reflectance to differences in degree of mechanical work replaced by the detergent. In order to accomplish this, it was necessary to investigate and express the following mathematically:

1) The relationship between reflectivity and the soil content of the test fabric.

2) The relationship between mechanical action and soil removal.

From the information gained, a relationship between mechanical action and reflectance changes is developed.

REFLECTIVITY AND SOIL CONTENT——Bacon and Smith *(1)* used the equation developed by Kubelka and Munk *(2)* to calculate the percent soil removed from a fabric by means of reflectivity values. This work has been extended in this paper to calculate the relationship between the fractional soil content of the artificially soiled fabric and the reflectivity. Calculations have been made for two fabrics having two arbitrary soiled reflectivities of 20% and 30% and representing two unit-soil contents. The initial whiteness of unsoiled fabric was 75% relative to MgO. Fractional soil contents for these fabrics are denoted as 1-S where S represents the fraction of soil removed. The reflectivity data and calculated fractional soil contents for each of

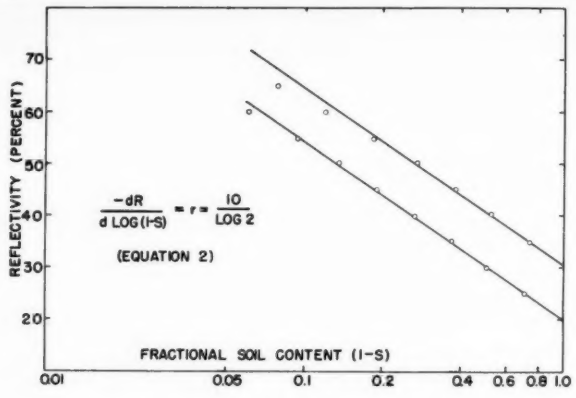

Figure 1
Monochromatic Reflectivity vs Relative Soil Content

two unit-soil contents over a range of values are plotted in Figure 1 with the logarithms of the fractional soil contents (1-S) as abscissae and the reflectivities (R) as ordinates. The plot of the data for a soiled fabric having 20% initial reflectance is essentially a straight line within the range 1-S = 1 and 1-S = 0.07%, or 93% soil removal. The plot of the data for a soiled fabric having 30% initial reflectance is parallel to the other and essentially straight up to 87% soil removal. Plots for other intermediate initial soil contents may be made by drawing lines parallel to the given plots in Figure 1.

The slopes of the straight portions of the curves in Figure 1 are practically equal. This slope is expressed by the following differential equation where R is percent reflectivity relative to MgO:

$$\frac{d\,R}{d\log(1-S)} = r \qquad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The numerical value of "r" is readily obtained from Figure 1. For example, on the lower curve when R = 43.8%, $(1-S)_2$ is 0.2, and when R = 33.8%, $(1-S)_1$ is 0.4. Using these values and integrating Equation 2 we obtain

$$R_2 - R_1 = -r \log \frac{(1-S)_2}{(1-S)_1}$$

$$r = -\frac{R_2 - R_1}{\log \frac{(1-S)_2}{(1-S)_1}}$$

$$r = \frac{43.8 - 33.8}{\log 2}$$

$$r = \frac{10}{\log 2}$$

Utermohlen and Wallace *(3)* have examined experimentally the relationship between the soil content and reflectivity of artificially soiled fabrics. It is of interest to note that the experimental curves of Utermohlen and Wallace deviate from a straight line at high reflectivities in the same manner as the calculated curves of Figure 1. The data of Utermohlen and Wallace may be used to calculate experimental values of "r". Values calculated from their experimental graphs are 8/log 2 for Germantown lampblack and 9/log 2 for Neospectra carbon black. These values for "r" are in fair agreement with the calculated value 10/log 2 based on a reflectivity of 75% for unsoiled fabric. It should be noted that "r" varies depending on the reflectivity of the unsoiled fabric. It increases with an increase in the unsoiled reflectivity. The calculated value of "r" when the unsoiled fabric reflectivity is 80% is $\frac{10.6}{\log 2}$.

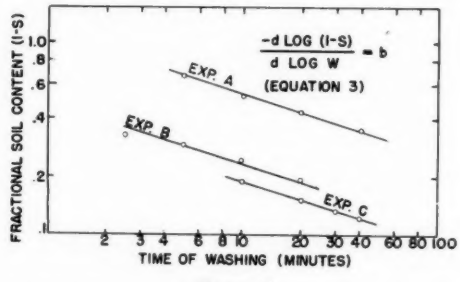

Figure 2
The Effect of Mechanical Work on Soil Removal in a Washing Process

MECHANICAL ACTION VERSUS SOIL REMOVAL——The relationship between mechanical action and residual soil in washing operations was determined by the following experiments. Swatches of soiled fabric were prepared and then washed in detergent solutions agitated in a Launder-Ometer. The general procedure previously described by Bacon *(4)* was followed. These experiments were carried out in a Launder-Ometer operating at 59 rpm. Each jar contained 200 ml of detergent solution, 20 stainless-steel balls (¼-inch diameter) and 2 soiled test fabrics 3 inches square. The temperature of washing was 120°F. Experiments were carried out with three different detergents. Experiment A was made with a 0.05% solution of a hydrocarbon sulfonate, Experiment B with 0.1% of a commercial nonionic type detergent, and Experiment C with 0.05% fatty acid soap plus 0.05% sodium metasilicate. The time of scouring was varied as indicated in Table I. The fabric used in Experiment A was more heavily soiled than in Experiments B and C. The detergent effect of water alone was eliminated in each set of experiments by a pre-rinse in water for the shortest time used in scouring with the detergent. After the prerinse the dirty water was discarded and the detergent solution was added to each jar for the washing step.

The experimental data obtained from the washing experiments are tabulated in Table I. The reflectance values R were obtained with a GE Spectrophotometer at 458 millimicrons and are relative to the reflectivity of magnesium oxide as 100%. The reflectivity values in Experiments A and B are the averages from 5 Launder-Ometer-jar replicates (10 swatches); the values in Experiment C are from 10 Launder-Ometer jars (20 swatches). The standard deviation for R varied between 0.2 and 0.9 in these experiments.

The values for 1-S (soil removal) in Table I were obtained from plots given in Figure 1. In Experiments B and C the

TABLE I

Time Minutes	Exp A R %	Exp A 1-S	Exp B R %	Exp B 1-S	Exp C R %	Exp C 1-S
0	23.1	1.0	30.0	1.0	30.3	1.0
2.5	—	—	46.3	0.33	—	—
5.0	29.5	0.66	48.4	0.29	—	—
10.0	33.1	0.52	51.0	0.24	54.1	0.19
20	35.7	0.44	54.5	0.19	57.6	0.15
30	—	—	—	—	59.3	0.13
40	39.0	0.35	—	—	60.7	0.12

values for 1-S versus R were read from the curve for a 30% reflectance for initial soil and 75% reflectance for complete removal. In Experiment A the values were taken from a curve having an initial soiled reflectance of 23%.

The experimental results tabulated in Table I are plotted graphically in Figure 2 with the logarithms of 1-S as ordinates and the logarithms of scouring times as abscissae. While the absolute value for the quantity of work employed cannot be established, the relative amount of work is measured by the time of washing, which fixes the number of revolutions of the Launder-Ometer operating at a constant speed. The three curves for the three detergents are essentially straight lines parallel to each other. Therefore, the slope of all three curves is

$$-\frac{d \log (1\text{-}S)}{d \log W} = b \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

The value of b in Equation 3 is obtained as follows:

$\log (1\text{-}S) + b \log W = \log K$

From the curve for Experiment A, $1\text{-}S = 0.54$ when W (time) $= 10$ and 0.44 when $W = 20$. By substitution of these figures the value of b is found to be

$\log 0.54 + b \log 10 = \log 0.44 + b \log 20$ and $b = 0.3$.

The value of b is also obtainable by measuring the slope of the curves in Figure 2.

MECHANICAL ACTION AND REFLECTIVITY ——— An important relationship between mechanical action and reflectivity (Equation 4) may be derived from the mathematical relationships now established by multiplying Equation 2 by Equation 3.

$$\frac{-dR}{d \log (1\text{-}S)} \times \frac{-d \log (1\text{-}S)}{d \log W} = rb$$

$$\frac{dR}{d \log W} = rb$$

$$\frac{dR}{d \log W} = 10 \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Equation 4 is important because, by integrating between limits, the change in reflectivity for any given change in relative work is obtained. For example, when the work is doubled

$$\frac{R_2 - R_1}{\log 2 - \log 1} = 10$$

$$R_2 - R_1 = 10 \log 2 \text{ and}$$

$$R_2 - R_1 = 3$$

TABLE II

Relative Efficiency in Terms of Reflectance Changes

R_2-R_1	RE
0	1
3	2
6	4
9	8
12	16
15	32
18	64

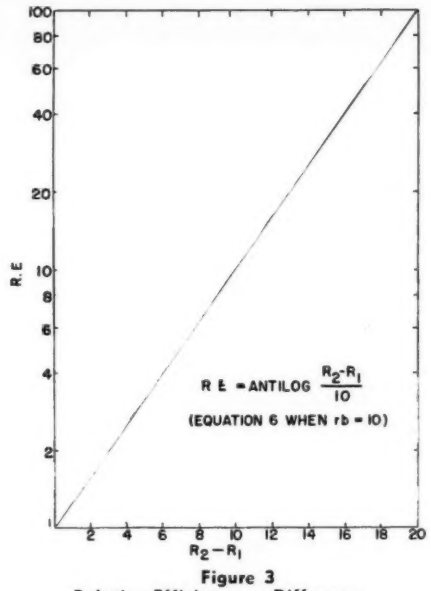

Figure 3
Relative Efficiency vs Difference in Reflectivity

Bacon and Smith *(1)* showed that the relative efficiency of any two detergents in a washing process is measured by the ratios of the work required to give the same degree of soil removal with both detergents at equal concentrations, that is

$$RE \text{ (relative efficiency)} = \frac{W_2}{W_1} \quad \ldots\ldots\ldots (5)$$

The relative efficiency of detergents or washing processes, in terms of mechanical work replaced, can now be determined from differences in reflectivity values obtained at a constant work level. A convenient equation for calculating the relative efficiency (RE) of washing processes by the use of reflectivity values from experimental curves is the following integrated form of Equation 4.

$$\frac{R_2 - R_1}{10} = \log \left(\frac{W_2}{W_1}\right)$$

Since $\frac{W_2}{W_1} = RE$, we have

$$RE = \text{antilog} \left(\frac{R_2 - R_1}{10}\right) \quad \ldots (6)$$

Equation 6 provides the basis for determining the relative efficiencies of washing processes insofar as soil removal is concerned. If the mechanical action provided by the machine is held constant, the relative efficiency of detergent baths can be determined. The efficiency of a detergent bath is governed by a number of

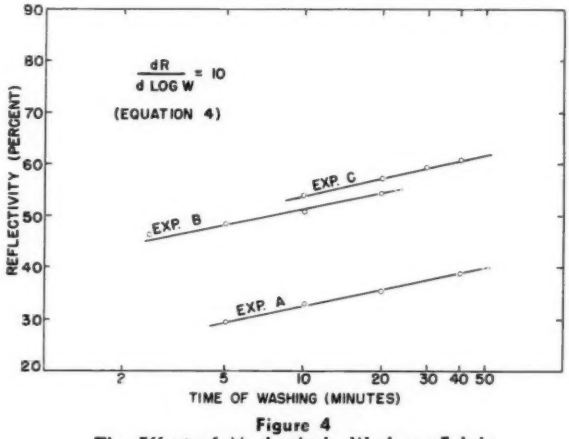

Figure 4
The Effect of Mechanical Work on Fabric Reflectivity in a Washing Process

variables, which include the type and concentration of detergent, temperature, pH, builders and type of water. The relative efficiencies of detergents can be determined directly from reflectivity data, if all other variables are held constant. Conversely, the relative efficiency of washing machines can be determined when all other variables are held constant.

Calculated values of RE for selected values of R_2-R_1 are given in Table II.

It should be noted that every time the relative efficiency is doubled, the reflectivity of the soiled fabric increases by 3. The relationships given in Table II are presented in graphical form in Figure 3 to illustrate a convenient method for obtaining interpolated values.

The data in Table 1 are plotted in Figure 4 with log W (as measured by time) as the abscissa and with reflectance as the ordinate. The three curves obtained show that the reflectance changes by 3 for each time the work is doubled. The curves have a constant slope, which can be expressed as $\frac{dR}{d \log W} = 10$. This corroborates Equation 4.

DISCUSSION

The basic problems that have retarded progress in the evaluation of the soil-removing power of detergents and washing processes by reflectivity data from artificially soiled fabrics are

1) The selection of a standard soiled fabric.

2) The selection of a standard washing machine.

3) The interpretation of reflectance data.

The first has not been solved on a broad basis. Solutions to problems 2 and 3 are presented in this paper for one soiled fabric, and the methods probably apply to other soiled fabrics.

The selection of a single soiled fabric to represent all soiled fabrics appears to be impossible. Unreported work done by the authors indicates that wide variations in greasy-type soils can be made without appreciably affecting the comparison of detergents. The amount of soil removed varies but the efficiency of the detergent does not. This is a logical result as long as the mechanism by which a soil is removed remains the same.

The selection of a standard washing machine is not critical as long as the mechanical work performed is adjusted to give suitable variations in soil removal. It has been shown that the same amount of soil is removed when equal amounts of work are applied by various mechanisms, such as changing the mass or number of steel balls in a Launder-Ometer jar and by varying the time cycle (1). Unreported work by the authors and others has shown that identical reflectivity-concentration curves can be obtained from a Launder-Ometer and a typical household washing machine by adjusting the washing time of the former to provide the same work level as the latter.

Concern over the obvious fact that the more easily removed soil comes off first has been eliminated, at least up to a very high degree of soil removal. It can be readily shown from Figure 2 that successively doubling the mechanical work (time) results in removing about 15% of the soil present at the beginning of each step. This uniformity must result from a balance between the decrease in soil content and the increase in difficulty of removing the soil or, what may amount to the same thing, the decrease in concentration of available soil. While the principles of this paper do not apply to very high reflectivities or soil removal, the broad operable range provides an adequate basis for the evaluation of detergents.

The application of the principles established in this paper and References (1, 4) lead to the following general recommendations for the evaluation of detergent baths:

1) Select a greasy type artificially soiled fabric with the soil fixed to a degree such that with the washing machine to be used, the spread in reflectivity (relative to MgO) between a water blank and a very efficient detergent bath is between 20 and 30 points with the normal time of washing.

2) Determine the constant "b" for the selected soiled fabric by using a detergent which gives a 10 to 15 point spread above the water blank in the normal operating time already selected. Then obtain 4 or 5 points of reflectivity by increasing and decreasing the normal washing time. Calculate the corresponding soil contents (1-S) from Figure 1. Plot the logarithm of soil contents as ordinates and the logarithm of the time of washing as abscissae. This plot should be a straight line. The slope of this curve is the constant b.

3) The difference in relative efficiency as represented by any two points of reflectivity R_2 and R_1 using the selected soiled fabric is given by the following equation—

$$RE = \text{Antilog}\frac{R_2 - R_1}{rb} = \text{antilog}\frac{R_2 - R_1}{\left(\frac{10}{\log 2}\right)b}$$

$$= \text{antilog}\frac{R_2 - R_1}{33.2\,b}$$

4) For convenience construct a graph similar to Figure 3 for obtaining interpolated values of RE.

CONCLUSION

The interpretation of reflectance data, except at very high values corresponding to greater than 90 to 95% soil removal, has been now accomplished. A simple relationship between the logarithm of the work in controlled washing processes and reflectivity has been established. It should be emphasized again that soil removal and redeposition are different phenomena and must be measured separately.

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54-18

Education: BS, Chemistry & Dyeing, Philadelphia Textile Institute, 1954.

Experience: Two summers in dyeing laboratories.

Age: 21; single; references; vicinity of New York City preferred.

8-30, 9-13

54-19

Education: high school.

Experience: superintendent of dyeing, wool and hats.

Age: 40; married; references; location anywhere in U S acceptable.

8-30, 9-13

54-20

Education: BS, chemistry.

Experience: Head dyer and finisher, with executive experience in laboratory dyeing development.

Age: 46; married; references. 9-13, 9-27

54-21

Education: BS, Chemistry, New Bedford Inst of Textiles & Technology.

Experience: nontechnical, but with references; now in US Army.

Age: 22; married; position as textile chemist desired, NE United States preferred but not essential. 8-30, 9-13

Southeastern Section——

SURFACTANTS IN THE TEXTILE INDUSTRY*

HECTOR C BORGHETTY
Rohm & Haas Co, Philadelphia, Pa

H C Borghetty

The speaker discusses the requirements of surface-active agents for the majority of textile operations and places particular emphasis on their adaptability for specific end uses. He covers the practical aspects of the preparation, dyeing and finishing of fibers and fabrics and calls attention to the improvements that can be obtained by careful selection of the correct surfactant. Applications of emulsifying agents and dispersing agents, as well as general surface-active effects, are also covered.

The trends of our textile industry are outlined, as well as the increased activity in stream-lining operations to gain greater efficiency and to lower costs.

INTRODUCTION

THE steady increase in the consumption of all classes of surfactants indicates the value of these products in the majority of wet textile-processing operations. Much has been said and written about the various types of surfactants, and many new products continue to be introduced to the industry. Often these are merely duplications of present well-known types, and they can therefore be used interchangeably, provided the strength, the diluent, and the raw material source are identical. As the choice of the best product for a particular operation is becoming increasingly difficult, an attempt will be made in this paper to correlate the various properties of the surfactants with their chemical types and specific end uses. It is no longer considered good policy to simplify the choice of surface-active agents by merely selecting one chemical type and using it for all the surface-active functions throughout a mill. As bleachers, dyers and finishers, you are interested in obtaining the highest efficiency from the chemicals required in your processing, and you desire to maintain a good competitive position in the various desizing, scouring, boil-off, dyeing and finished operations. It is only possible to achieve this effect when the selection made for each specific operation is the best available at the time.

Generally speaking, a surfactant can be classified as a stabilized soap substitute, because soap in itself possesses most of the surface-active requisites that an all-around surfactant should have. Since it lacks chemical stability, however, it cannot be used except for scouring operations. Synthetic detergents have been developed that embody many of the good properties of soap, but they usually have other drawbacks and cannot be considered completely versatile. In endeavoring to duplicate all the good soap properties and to eliminate the objectionable features of soap, the chemical industry has been successful in reproducing many of the good single features, with the result that we now have products possessing outstanding characteristics that can be utilized in individual operations to give optimum working conditions, high efficiency and good economy. This is one of the reasons that so many compounds have been made available and explains just why it is usually necessary to have several materials on hand.

A GENERAL CONSIDERATION OF SURFACTANTS

The main effects of a surfactant are emulsification, detergency, wetting, dispersion, and lubrication. Stability to electrolytes, to hard water, to acids, and to alkalies is of major importance in attaining these effects satisfactorily. Stability to acid and stability to alkali can often be obtained only at low temperatures and/or in low acid or alkali concentrations. There are occasions, however, when high temperatures and high concentrations of a chemical media are required. Stability in the presence of electrolytes is important during scouring and dyeing operations. Foaming characteristics should be subject to control. Characteristics in addition to the above that are important during finishing operations involve the effect of the compound in dye fixing, water repellency and fiber lubrication. The ionization of the product is also a factor that needs to be taken into consideration. Dyestuffs are ionizable and are therefore sensitive to the addition of ionizable surface-active agents, particularly if of reverse charge. Hence, we have observed the introduction of nonionic surfactants, which are rapidly acquiring a vastly more useful status in our industry. The effect on retardation of dyeing needs to be considered in relationship to the color yield, which is one of the most important factors in controlling costs. The recent increased activity in pigment dyeing calls for the development of superior dispersing and wetting agents that do not foam and also do not display detergency, so that pigment is not removed from the fiber readily during the washing operation.

Desizing operations require that the surface-active assistants impart excellent wetting, low foam, high chemical stability in case the goods proceed directly to the kier or come into contact with alkaline scouring liquor of high concentrations. It is also preferable that the surfactant used have detergent properties so that, in addition to performing its wetting function during the desizing, it can later act as a detergent in the scouring or rinsing operation that follows. The surfactant selected must have no deleterious effect on the delicate biological properties of the enzyme, that is, it should assure high wetting without loss in enzyme efficiency. Lack of foam, high detergency, good wetting, and lack of impairment of biological effect are extremely difficult to obtain in one product unless it is specifically designed with these properties in mind.

The types of fibers in combination fabrics on which the product is to be used become extremely important because selective adsorption on the various fibers may rapidly change the composition of the bath and interfere with materials to be added to the fiber later. The trend towards blended fabrics requires us to be alert to all such developments.

The complex amphoteric property of wool that allows it to function as an acid or an alkali according to the environment in which it is processed is an important factor to be considered in the selection of cationic or anionic materials used as

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assistants either in scouring, dyeing or finishing. The carbonizing of foreign cellulosic materials in wool by treatment in a strongly acidic bath requires that the assisting surfactant display good wetting of the cellulose, low adsorption on the animal fiber, high chemical stability to acid and to baking and also high stability and good rinsibility during subsequent alkaline washing.

The problem of separation of the newer synthetic fibers in fabric mixtures has not yet become a major factor but is one which will further complicate the picture. A tool for this purpose is dimethylformamide, a solvent for Orlon, which can be used to separate this fiber in combination with other nonacrylic synthetics and with natural fibers. Applications of such solubility can lead not only to the separation of the fiber for analytical purposes but also to burnt-out effects achieved either in printing or in finishing.

Surfactants possessing true wetting properties without any of the other primary characteristics of synthetic detergents are now available and are acquiring increased popularity. Such materials are applied mainly during padding operations and wherever emulsification and detergency are considered as deleterious properties. Highly solubilized wetting agents that possess rewetting properties have been developed. This characteristic — a rather rare one — is utilized to increase the absorbency of fabrics prior to dyeing or finishing, as well as to render towelings more absorbent. Surfactants that have low foaming characteristics are available but are not yet fully exploited because it appears that the foam usually accompanies good general surface activity. The use of foam depressants in conjunction with surfactants is not a good approach to the problem of foam control because of the interference of such agents with the intrinsic aspects of surface activity. High stability to alkali, as required in mercerizing, is difficult to achieve with a regular surfactant, particularly where foaming is a hindrance to the recovery of caustic-soda solutions.

The effect of level dyeing can be obtained either by high wetting efficiency to give uniformity of distribution of the dyestuff, by a solubilizing effect on the dyestuff, or by control of the chemical dyeing characteristics of the fiber and the dyestuff. In the dyeing of acetate fibers with acetate dyes, dispersing agents have been found more effective than emulsifying and leveling agents. This accounts for the success of good dispersants that are completely devoid of detergency and wetting properties in the dyeing of acetate. In fact, the sodium salt of a sulfonated naphthalene-formaldehyde condensate is the only material available that fully answers the requirements of high dispersion with complete absence of prime surface-active characteristics. Furthermore, it is practically foamless and can be used under severe conditions of high speed and agitation at all temperatures. This type of product has extremely high chemical stability but has not yet branched into many phases of the textile industry. In reference to the theory of dispersion, it may be interesting to point out the following: When an aqueous slurry of most untreated solids is prepared there is a tendency for the solid particles to adhere to one another on collision; that is, the attractive forces between particles is large. This particle attractive force causes particle agglomeration, or flocculation. The state of flocculation can be observed in several ways. In concentrated slurries flocculation results in very high viscosity. In dilute slurries the state of flocculation is recognized by rapid sedimentation of the aggregates or flocs. The flocs will settle much more rapidly than would the individual particles.

It is possible to introduce into the slurry a dispersant which will be adsorbed on the surface of the particle. This dispersant may act in two ways. It may act by forming a protective colloid layer, which prevents particle aggregation. More often, however, it acts by putting a charge on the particle. As a result of having ionizable groups, these dispersants, when adsorbed on the surface of the particles, give all the particles the same charge. The electrostatic repulsive forces are then large enough to overcome the normal interparticle attractive force and to keep the particles separated. The system is then said to be deflocculated. The state of deflocculation is easily observed. In concentrated slurries the viscosity will be much less than in the flocculated state. In dilute slurries the deflocculated particles will sediment much more slowly than in the flocculated state.

It is expected that, with increased demands for pigment dyeing, the use of dispersing agents of a nonfatty nature will assume great importance. The recent upsurge in interest for the mass dyeing of viscose and acetate fibers prior to spinning calls for the incorporation of dispersing agents of low chemical reactivity and high stability. Dispersing agents can be used with colloidal agents and still lead to the development of improved detergents at present utilized in the household field, although not yet for extensive use in the textile industry. A parallel, however, exists in our industry when one considers the precipitated soap which is formed in hard water and then dispersed by the further addition of soap in order to obtain suds. The lime and magnesium soaps formed are actually dispersing agents emulsified and carried by the soap to contribute to the scouring effect. The textile industry utilizes soaps in conjunction with synthetic detergents in order to achieve this condition during the rinsing cycle where the introduction of further hard water would precipitate even the excess soap. This point is the basis for the use of synthetic detergents in conjunction with soap for many textile uses and demonstrates the supplementary characteristics of soap and syndets. The use of polyphosphate to protect the soap as a third component during the scouring cycle further enhances the detergent effect and assures good rinsibility.

SPECIFIC EXAMPLES OF THE USES OF SURFACTANTS

Specific selections of surfactants for certain textile operations can be typified by the following examples:

KIER-BOILING COTTON——A surfactant able to impart better bottoming of cotton goods must possess high detergency, good stability to alkali at the boil, excellent emulsification, good rinsibility, and good carrying properties for soil from the fabric during rinsing. Furthermore, it must act to prevent channeling, and it must provide good wetting of the fabric during saturation with caustic soda solution. Pine oil is often a standard component of kier-boiling assistants and supplies the required wetting and penetrating properties. Synthetic detergents of the fatty alcohol sulfate type have the necessary emulsifying and detergent properties and offer good lubrication of the fiber to eliminate wrinkling. Nonionic surfactants promote good emulsification of cotton waxes and impurities, provide good detergency, and bring about quick rinsibility at low temperatures. They lack the high lubricating effect of the fatty alcohol sulfates.

BLEACHING——In peroxide bleaching, stability to alkali and peroxide with minimum effect on the catalytic decomposition of the latter becomes the main qualification. It is also advantageous that the product act as a good detergent so that, during the subsequent rinsing operation, the impurities can be removed. This is of particular value in continuous peroxide bleaching where the operation is carried out on the greige goods. For all peroxide bleaching, fatty alcohol sulfates rank high, and the same is true for chlorine bleaching where the operation is carried out by saturating or immersing in cold solutions for long periods.

CONTINUOUS MERCERIZING OF COTTON YARNS——Continuous yarn processors have difficulty in scouring the raw cotton prior to mercerizing. The

preboil of only 1½ to 2 minutes must simulate a kier boil in order to render the cotton clean and absorbent and to make it equal in luster, after mercerization, to the results obtainable by skein mercerization. The customary boil-off baths, which usually contain NaOH at 5-10°TW, often give good results. The large warehousing of cotton crops has recently introduced greater variation in the cotton grades present in yarns. This in turn requires a more thorough bottoming of the fiber in order to avoid variations in luster and in dyeing qualities. Improved cleaning of the yarn can be obtained by adding a nonionic detergent to the boil-off in order to maintain good emulsification of the cotton waxes, pectic substances and other impurities. The detergent for this purpose must answer the following requirements:

Stability to NaOH at 5-10°TW and 212°F.
Low foam.
High detergency.
Quick rinsibility from the yarn to avoid carry-over to the mercerizing bath with subsequent accumulation in the rinse, accumulation of surfactant causes foam and loss of recovery efficiency during distillation.

The more highly solubilized nonionics were specifically designed for kier boiling and possess the above necessary attributes also with regard to rinsibility and foaming. Few other detergents have excellent detergency and solubility under the strong alkaline conditions required, and no other type has ready rinsibility at low temperatures.

Yarns scoured with the addition of nonionic ethers have greater cleanliness and increased luster after mercerizing. The scouring liquors maintain excellent dispersibility, and more impurities are removed during the rinse.

CONTINUOUS BOIL-OFF OF RAYON FABRICS———In the continuous boil-off of rayon fabrics the selection of a detergent must take into consideration the high liquor ratios involved and the quick rinsibility of the product. As oftentimes rayon fabrics remain in the detergent solution for periods of only three to twenty minutes, the efficiency of the detergent must therefore be high and rinsibility, good. Nonionic detergents, because of their extremely effective detergency, are rapidly displacing all others for this type of work. Extremely low concentrations of these materials are being used for the scouring of viscose, acetate and nylon fabrics.

In Hinnekens, Cascade, VanVlaanderen and similar units, one pound of detergent per 1000 gallons gives excellent detergency on a wide variety of spun and filamentous fabrics. The good absorbency and cleanliness imparted give more uniform dyeing because the nonionic detergent is far more efficient than even the best type of sulfonated detergent. One pound per 1000 gallons represents the average figure, but on easily scourable fabrics ¼ pound can be used, while on heavier fabrics 1½ pounds is advisable.

The feed-on addition of the detergent is calculated on the basis of the poundage of cloth entering the bath rather than on the volume of liquor removed. The volume removed varies according to spray waters, overflows, etc. The cloth may enter either dry or wet, and the detergent is best used in conjunction with alkalis fed at such a rate as to maintain a pH in the bath of 9, which gives best detergency. The rate of feed of alkali necessary is largely governed by the acidity of sizes present in the yarns.

The following formulation is suggested for the average fabrics processed in continuous boil-off:

Bath temperature
180-200°F
pH of bath
initially, 9 to 11
during run, 9
Initial charge per 1000 gal
nonionic detergent, 1 lb
soda ash or polyphosphate, 10 lb
Feed per half hour (approx)
(for 500 to 1000 lb, or
2000 to 4000 yd of fabric
at 30 yd per min)
nonionic detergent, 1 lb
soda ash or polyphosphate, 1 to 4 lb

The maintenance of pH is subject to the acidity of sizes and the type of alkali. Soda ash is most economical and effective but has less detergency than the more expensive polyphosphates, $Na_{x+2}P_xO_{3x+1}$. Of the polyphosphates, Calgon is expensive and not heat stable. Quadrafos and Phosphotex are the most heat-stable, while tripolyphosphate is intermediate. After the goods leave the machine, they should be rinsed, and the heavier fabrics should be run an additional half-hour at the boil in one pound of detergent per 1000 gallons.

RAW-STOCK SCOURING OF WOOL———An example of the selection of a specific detergent for the raw-stock scouring of wool has shown that the nonionic detergents are unsurpassed for this kind of use, giving low scouring cost, quick rinsibility, a softer and cleaner stock, in addition to permitting the use of lower alkalinities and eliminating the presence of the harmful tacky hard-water salts which are present when soap is used. The average wool containing 15% grease and 25% dirt and other impurities can be scoured to 0.5% grease at a total detergent consumption of 2 lb per 1,000 lb of greasy wool. It has frequently been found possible to reduce the scouring time appreciably when nonionics are used, thus effecting further savings in cost. They rinse out readily in cold or lukewarm water, carrying the alkali with it, in a much shorter time than soap. Another important advantage of a detergent over soap lies in the high degreasing qualities under mildly alkaline conditions. The alkali can thus be concentrated at the beginning of the scouring cycle, where the wool is best protected by high initial grease content. Subsequently the synthetic is used to scour the last 2-3% of grease, which is the most difficult to remove. The bath at this stage is less alkaline and less harmful, and the removal of the alkali from the fiber is accomplished effectively in the subsequent rinsing bowl.

The initial bowls, charged with soda ash, have a pH of 11.2. This pH decreases gradually to 9-10, because of the consumption of alkali by the wool grease, and the conversion of soda ash to bicarbonate. The scouring bowls containing nonionic detergent are maintained at pH 8-9 by the carry-over of alkali with the wool itself. Since no additions of soda ash are necessary here, there is less alkali to be neutralized during dyeing, and less danger of drying alkali into the delicate, clean, wool fiber.

As the affinity of a nonionic for wool is low, no detergent is left on the wool. This point is of advantage, particularly for wool on the worsted system, where traces of grease and soaps often cause "balling" on the cards. The resulting scoured wools can be carded at 1% grease content without difficulty, whereas soap scoured wool at 1% grease content gives trouble because there is an additional 0.3% of soap present.

The lime-salt stability of the monionics and their ability to disperse lime soap eliminate any danger of curds, even in the presence of high-lime-content wools. Nonionics are readily adapted to any system of circulation in the bowls. Desuinting in the first bowl with water or exhaustion from the rinse bowl is satisfactory and advisable. Counterflow systems can be used, although individual circulation of the liquor in each bowl gives the best control and the highest recovery of grease.

The recovery of wool grease can be carried out on mechanical systems of centrifugal separation without interference by the nonionic. Sixty percent grease recovery is considered good for such equipment. Chemical separation can be accomplished by variation of standard procedures.

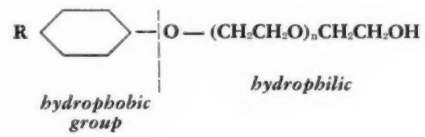
SCOURING WOOL TOPS———The good detergency and quick rinsibility of the same nonionic detergent will be found effective at 1 oz per 10 gallons for scouring wool tops in the back washer.

DYEING OPERATIONS———The selection of surfactants in dyeing operations is always governed by the chemical constitution of the product, the chemical nature of the dyestuff and the constitu-

tion of the fiber to be dyed. For wool dyeing, generally speaking, sulfonated wetting agents are the most appropriate for level dyeing because the sulfonic group can combine with the amino groups of the wool and thus compete for position with sulfonated dyestuffs. Molecules resembling the acid dyestuffs themselves perform this function better than soap-like molecules because they are assisted by the adsorption on the fiber. The best surface-active agents to assist in dyeing wool are the alkylarylsulfonates, the sulfosuccinates, the alkylnaphthalenesulfonates and the fatty alcohol sulfates. These products all have the necessary wetting efficiency. The true sulfonic group possesses ideal stability in boiling baths and is suitable for chrome complex acid dyestuffs, while the ester types are not. High-mol-ratio ethylene oxide derivatives of alcohols exert a leveling action because they maintain the dye molecule dispersions in the bath at the beginning of the dyeing cycle, and as the operation proceeds the dyestuff is permitted to go gradually on to the fiber. Such a material is the polyoxyethylene ether of fatty alcohol, which gives the best results in dyeing Neolan and Palatine dyestuffs, which require extremely high acid concentrations.

In the dyeing of cellulosic fibers when the colors are of the substantive types, the presence in the surfactant of a sulfonic group is not important. The best results are obtained when the assistant has high wetting properties, as is the case with most of the surfactants available. Nonionic agents capable of maintaining the molecular dispersion of the dye in the bath are of great value for substantive dyestuffs; products such as the fatty-alcohol-polyether type are satisfactorily used because of this property even though they possess low wetting effect. The alkyarylpolyethoxyethanol detergents, on the other hand, can be considered effective when the dyeing cycle is carried out over a long period because their solubility decreases gradually as the temperature is raised. The leveling effect is thus counteracted and the dyestuff is freed to exhaust. The fatty-alcohol ethers do not show this loss in solubility and therefore control the dyeing operation even at the higher temperatures. They are also best for leveling vat dyestuffs which, when in reduced state, are actually substantive dyes.

EMULSIFYING AGENTS FOR OILS ——The lubrication of fibers with fatty and mineral oils prior to carding and spinning involves many of the more unpredictable qualities of the surfactants. The introduction of nonionic types has in addition opened up an entirely new principle of oil emulsification because of the gradual increase in water solubility obtainable by increase in solubilizing effect. Nonionic surfactants showing a wide range of hydrophobe—lipophile balance (HLB) are possible by simply starting from a standard hydrophobe and reacting it with ethylene oxide to give the following:



The hydrophobic portion, if for example iso-octylphenyl, gives various water or oil solubilities for different values of n. When n is 2 to 5, the resultant products are oil-soluble emulsifiers having poor detergency. They emulsify in water but do not dissolve. When n is 6 to 12, the solubility in water in greatly improved and the oil solubility is reduced. Detergency and wetting result particularly at the 130-180°F scouring range. When n is greater than 12, detergency and wetting decrease, while the water solubility and water-emulsifying characteristics increase. Products of values close to 11 to 14 have excellent detergency if applied at 180-200°F. A product designated by $n = 5$ is actually a mixture of homologous polyether alcohols. The higher members of this series are insoluble in paraffinic solvents; the lower are soluble and are also solvents for the higher members.

Mixtures of various compounds of differing iso-octylphenol ethylene oxide can often be used advantageously to give emulsions of oils and mixtures thereof. When greater water solubility of the final emulsions is desired, the value of n can be 10; for even better water solubility at high temperatures or in the presence of electrolytes, it may be necessary that n have a value above 10. Should it be found that even then the water solubility or emulsifiability is lacking, it will be necessary to use a member where $n = 20$ to 40. Such a type is available; however, the hydrophobe is no longer the octyphenol described above but a straight-chain fatty alcohol (principally octadecyl). The molecular weight of this hydrophobe is thus similar, but the greatly increased oxyethylene content gives an unusually high hydrophilic balance.

Another rather specialized member of the nonionic series is a dimeric alkylphenoxyethanol type, which forms good emulsions of aromatic hydrocarbons, such as toluene, of aliphatic hydrocarbons, such as kerosene, and of esters, such as dimethyl phthalate. It has good wetting, good detergency, and low foaming effect, and it completes the range of the nonionic emulsifiers.

QUESTION-AND-ANSWER PERIOD

Question: What kind of dispersing agent can be used at pH 2?

Answer: Naphthalene-formaldehyde condensates.

Q: When nonioncs are used to promote level dyeing, how can their action be maintained at the boil

A: Use a highly solubilized type that has a cloud point of 190-200°F.

Q: How do you avoid the excessive retarding effect of nonionics on acetate dyes?

A: Use the old standard material having a cloud point of 150°F. As the dyeing temperature passes 150°F, the leveling effect will be lowered and the color will be freed to dye the fiber. The leveling action has then taken place and the tinctorial yield will be satisfactory.

Q: Are vat dyestuffs in paste form easier to disperse than the powder types?

A: Generally speaking, yes. The paste form has not been subjected to the drying conditions that tend to lower dispersibility.

Q: What advantages have the vat-powder types, apart from any economical considerations?

A: They are easy to store and do not dry out.

Q: Do they have more dispersant present?

A: Yes.

Q: What type of dispersant is used?

A: Often the nonfoaming, pure dispersants, such as the sodium salts of naphthalene-formaldehyde sulfonic acid.

Q: Why do dyestuffs contain different dispersing agents, and why do not the dyestuff manufacturers reveal the type of dispersant used in vat dyes?

A: Each dyestuff presents a separate problem. Dispersibility and particle size are directly connected to color value and absence of speckiness of the final dyeings. Hence, the secrecy to guard the highly specialized effort devoted by the dyestuff companies to this phase of manufacture.

Q: I note a variation in recent years in the type of dispersing agent used, also a problem of compatibility of the vat pigments with dispersing agents and would like to use dispersants to further assist uniformity of dyeing in package machines.

A: For economic reasons the lignosul-

fonate dispersants have been quite extensively used in recent years. They are less stable and less pure and often require the assistance of sequestering agents of the polyphosphate or amino carboxylic type. The theory of dispersing agents is just being fully understood and applied. A colorless, salt-free dispersant was introduced as recently as 1952. The problem of the compatibility of dispersants with the unknown dispersants already present in vat pigments can be solved only by trial. Often a third component can be introduced to act as a codispersant.

Q: Does excess dispersant interfere with color value in vat dyeing?

A: In pigment padding, no. In package dyeing or wherever else the factor of fiber substantivity is present, yes.

Q: Are colloidal agents preferred to dispersants?

A: Protective colloids are effective in maintaining the stability of pastes and dyebath liquors. They do not perform the important functions of dispersibility but can often perform a supplementary role.

Q: Surfactants are erroneously classified as stable by many salesmen. Actually, in trials I have found that they are chemically stable but subject to great sensitivity to the addition of acid, alkali or electrolytes in general.

A: Yes, the solubility of a surfactant is sometimes readily disturbed by the addition of electrolytes, variation in pH, temperature range and concentration of solution. The choice, however, can be made to meet required conditions. Nonionics can be made to salt out readily to meet conditions of use (level dyeing) or they can be prepared to possess high electrolyte stability at use concentration if not also at stock solution concentrations. The solubility of a surface-active molecule is a function of its hydrophilic balance. This balance is designed for certain optimum effects under specific end-use conditions. When used under adverse conditions, the product can become ineffective.

Q: Is there available an emulsifying or dispersant type that can be considered acid, alkali and electrolyte stable at the boil without possessing selective substantivity for fibers?

A: Yes. At use concentration the extremely hydrophilic high-ratio ethylene oxide nonionics can be used. This is a good case of choice of surfactant for a specialized end use. The material has the emulsifying properties which have been embodied into the product at a sacrifice of detergent and wetting efficiency.

Q: Please give a trade name for the chemical type.

A: Triton X-67 and Peregal O both meet the requirements.

Q: Where are the oil-soluble surfactants used?

A: For general lubrication of yarn and as spinning assistants. The oil solubility and the water emulsifiability guarantee ease of application followed by removability during the subsequent scour.

Q: What are the optimum use concentrations for synthetic detergents and wetting agents?

A: Based on fully active product, the concentration 0.2% (approximately 27 oz per 100 gallons) is the top concentration required. Surfactants are remarkably effective in minute amounts, increase slowly up to the 0.2% figure, and then level off. Concentrations of 1% are in most cases unnecessary and certainly uneconomical.

Q: What characterizes a rewetting agent from a wetting agent?

A: All rewetters are excellent wetters but not vice versa. Rewetters must maintain extreme speed of solubility even after being dried into fabrics, so that they wet back immediately. A few wetting agents, mostly those of the sulfonated branched-chain alkyl-ester type, exhibit this effect instantaneously. Many others will wet back if the action is prolonged.

Q: Can the theory of surfactants be proven mathematically?

A: Yes, the surface-active theories based on contact angles, surface tension, and interfacial tension can be vividly illustrated and mathematically proven. The newer compounds have been synthetized on a basis of molecular characteristics, orientation in solution, stability ionization, etc. Many products have been field-tried successfuly after predicted scientific adaptability for end use.

Q: How can speckiness be avoided?

A: By the use of dispersants of emulsifiers that do not detract from color yield. An after treatment to eliminate speckiness is not as satisfactory as the use of the surfactants prior or during dyeing to avoid scum formation. This can be shown readily in vat, acetate, naphtol or pigment dyeing.

Q: Are foamless wetting agents as good as the foamless type?

A: Much progress has been made in devising foamless surfactants, but the best types are still accompanied by foam.

Q: Can defoamers be used to control foam in detergent systems, in finishing or in pigment dyeing? If so, what do you recommend?

A: Foam can be controlled by the use of defoaming agents of the silicone type in finishing or detergent baths or by the addition of intermediate-length alcohols (6-8 carbon atoms), which can be added to the surface of the foaming solution. These lose effectiveness when emulsified into the solution. I would not recommend the use of either type in pigment dyeing, however, but would approach that problem by eliminating the foam-producing surfactant and substituting it with a foamless material.

Q: What foamless type is available commercially?

A: The naphthalene-formaldehyde condensates are commercially available, for example, under the designations of Tamol and Blancol.

Q: Of what value are wetting agents for the dyeing of highly crystalline fibers?

A: When the crystallinity or degree of orientation is not excessive, such as in acetate fibers, the surfactant is extremely helpful. Where the crystallinity is extreme, as in the case of the newer hydrophobic fibers, the surfactant cannot do much, and it becomes necessary to solve this problem by the use of swelling agents to assist in rendering the fiber receptive to the dyestuff.

Q: Of what value is a wetting agent on a fabric that is already wet?

A: Although you cannot wet the fiber further, there is still a decided improvement obtainable the moment a dyestuff or any chemical is added because the surfactant can facilitate the interchange of the water by the chemical added or give greatly improved distribution of the dye at the surface of the fiber.

Q: To what degree do anionics occupy chemical sites on some reactive fibers?

A: Some sulfonic types surfactants will actually exhaust on the fibers having available reactive sites, such as NH_2. They do so only temporarily, however, and later yield position to the more complete and less water-soluble dyestuff.

Q: What types in excess cause a loss of color yield?

A: The naphthalene derivatives and triphenylmethanesulfonates, which are closer to acid-dye configurations, can be almost described as colorless dyes. They are, in fact, utilized as reserving agents, or in blocking wool from staining in the presence of direct cotton dyes. Long-chain fatty and alkylarylsulfonates, on the other hand, yield position readily to the dyestuff during boiling.

Mid-West Section——

NEW RECOMMENDED TEST CONDITIONS AND OPERATING PRACTICES FOR LIGHT FASTNESS TESTS IN THE FADE-OMETER*

J E NORTON

Atlas Electric Devices Co, Chicago, Ill

INTRODUCTION

SYNTHETICS, whether they are in the form of fibers, fabrics, films, finishes or manufactured articles, have all required both the use of new materials and more accurately controlled methods of production, processing and manufacture. It is therefore logical to expect that, with their new and widely varying properties and characteristics, proper evaluation of these materials will necessitate either new or modified test methods with more accurate control of the test conditions. This is particularly true of accelerated tests, since in these the acceleration is usually obtained by applying one of several of the contributing factors at a rate or level greater than is normally encountered in ordinary use.

While an accelerated test may have been generally satisfactory for most of the more familiar natural materials for which it was originally developed, quite often for synthetics it is necessary to modify and exercise more careful control over the various conditions of the test and, in many cases, to sacrifice some of the acceleration if results are to be satisfactorily in agreement with end use. Often the new or modified test conditions which have been found most satisfactory for the synthetics have also helped to eliminate minor discrepancies known to exist on the more familiar natural and previously used materials. This has been found to be particularly true in accelerated light-fastness and light-aging tests, and this discussion will cover some of the more recent developments in both Fade-Ometer and sunlight tests.

As you are well aware, we, the manufacturer of the Fade-Ometer in co-operation with the AATCC and other trade associations, have for some time now been engaged in extensive studies to learn what can be done to make the Fade-Ometer generally more useful in predicting end-use light-fastness qualities.

J E Norton

Many textile chemists have the idea that the AATCC Standard Sun Test is a straightforward practical test, which always gives the same rate of fading of any specimen in comparison with the Blue Wool Light-Fastness Standards. The author points out that this test is really an accelerated test and that some conditions —especially that of specimen temperature —are not always the same during a sun test. This can lead to variable results in ratings of samples against the Blue Standards.

Such variations in fading may also take place in testing light fastness in a Fade-Ometer, plus other variations proceeding from faulty operation of the Fade-Ometer. Directions are given for operating a Fade-Ometer for least variation and for checking the results to obtain good uniformity of fading in day-to-day operation and between different Fade-Ometers. The correlation with properly conducted sun tests will then also be very good.

FACTORS IN TESTING SUNLIGHT FASTNESS

Because of the difficulty in making tests under the wide variety of conditions to which materials are subjected in actual end use, it has long been the practice to accept sunlight tests as the standard or true test in evaluating light-fastness performance qualities. Most of us do not ordinarily consider the AATCC Tentative Test Method for Sunlight Tests as an accelerated test. Yet, while the exposure conditions of the Sunlight Test are desirable and are to be generally recommended if time permits, the Sunlight Test is actually an accelerated test.

Exposure in a well-ventilated cabinet under glass, while protecting the specimens from dirt, moisture, etc, usually produces an increase in the specimen temperature, which also increases the rate of fading. Having the cabinet inclined due south at an angle of 45° provides the most direct angle to the sun and thus produces the maximum radiation intensity. In northern latitudes we also expose the samples between the hours of 9 AM and 3 PM on sunny days between April 1 and October 1 for a total of 6 hours per day to obtain the maximum number of hours at a useful radiation intensity, whereas most materials are fabricated into products which, in end use, receive considerably less exposure on a total lapsed-time basis. Exposure in more southern latitudes with increased intensity of sunlight over a greater number of days per year also provides acceleration.

Investigations completed to date on sunlight tests have indicated that there is no appreciable difference in the character of fading produced in direct sunlight or under glass, under a wide variety of exposure conditions. While there is no appreciable difference in the character of the fading, we have found major differences in the rate of fading under various conditions in sunlight, both direct and under glass, with no uniformity as to rate between either materials or variations in exposure conditions.

LIGHT-FASTNESS STANDARDS ——In general it has been found that the AATCC Blue Wool Light-Fastness Standards under a wide variety of sunlight exposure conditions show a minimum variation in their rates of fading and are thus quite satisfactory for the purpose for which they were intended. Other materials have been found to exhibit quite wide differences in their rates of fading under the various conditions of sunlight exposures with no apparent uniformity in their rate of fading. It should be borne in mind that

* Presented before the Mid-West Section on February 13, 1954. Ms submitted by the Editor of *Proceedings* 7/5/54.

the light-fastness ratings of materials obtained from a simultaneous exposure with the Blue Wool Standards are thus an expression of their relative fastness in terms of the standards under that particular exposure condition and that in other exposure conditions the relative fastness of the materials to the standards may be quite different. While many other methods of classifying or rating light-fastness qualities have been employed, such as measurement of the radiation received in terms of Langleys, these methods usually measure only one factor of the test, whereas the Blue Wool Standards integrate the effect of all the various factors of the exposure condition.

Materials have actually been encountered which will, under various sunlight exposure conditions when graded against the Blue Wool Standards, receive light-fastness classifications which differ by as much as two to three classes. For example, one dyeing in an exposure under glass in April might show just appreciable fading no sooner than Standard L-6, in which case it would merit a rating of Class 6. However, the same dyeing when exposed in August might show appreciable fading before the Standard L-4, in which case it would receive only a Class 3 rating. Another material with a sensitivity similar to that of the standards would receive a classification of Class 6 for both the same April and August exposures.

This can be better rationalized when one considers the sensitivity of some of the materials to temperature, spectral distribution absorption characteristics, etc, and the variations of these factors which are encountered in sunlight exposures, and over which we have little control.

SPECIMEN TEMPERATURE——While sufficient evidence is not yet available to be definitely conclusive, there are indications that the specimen temperature is perhaps the greatest single contributing factor influencing the rate of fading. Generally, increases in specimen temperature cause increases in the rate of fading, but the rate of increase in fading is far from uniform on the various materials.

Specimen temperatures in sunlight testing, as in the Fade-Ometer under the same test conditions, will of course vary with each material and for the same materials will vary with the intensity and spectral distribution of the radiation received and the amount of heat removed. The variations in intensity and spectral distribution of sunlight are well known. In exposure under glass certain percentages of the radiation are absorbed by the glass and the absorption varies in different portions of the spectrum.

This absorption causes an accumulation of heat in the glass, which is dissipated by convection, conduction and radiation. While much of this generated heat is dissipated by convection and conduction, some remains and is dissipated as infrared radiation. Since radiation varies inversely as the square of the distance, the closer the specimens are to the glass the more infrared radiation they receive from the glass. The volume and temperature of the air in contact with the specimens produced by ventillation of the cabinet as well as the volume and temperature of the air around the outside of the cabinet all affect the amount of heat removed from the specimens.

While there is evidence that variations in radiation intensity and other factors all influence the rate of fading since all are so closely related to and affect specimen temperatures, it is exceedingly difficult to separate and assess the individual effect of each factor. Tests are planned for this summer however, which will permit such an evaluation.

Since sunlight tests, according to the exposure conditions under which they are conducted, can produce such a wide variety of results, rating materials of unknown performance on the basis of one sunlight test may thus be very misleading, and for this reason sunlight tests should be conducted under the various conditions to which the materials may be subjected in end use for a complete understanding of performance qualities.

A more complete investigation of sunlight testing under widely varying conditions to determine the relative effect of the various test factors is now in progress with the hope that the information developed will be practically useful in devising better methods for conducting both sunlight and Fade-Ometer tests.

IMPROVED FADE-OMETER TESTING

To provide maximum usefulness, Fade-Ometer tests must be conducted under a uniform set of operating conditions which for the greatest number of materials produce results that are in general agreement with the mean or average of the rates of fading encountered in the various conditions of sunlight exposures.

While the work is far from being completed, sufficient data are now available to indicate that changes in the test conditions of the Fade-Ometer test should be made immediately and not held up until the pending investigations are completed. On this basis the AATCC Research Committee on Light-Fastness now recommends that the Fade-Ometer be operated so that it produces approximately 20 standard fading hours in 20 clock hours of operation at a black-panel temperature of not over a maximum of 165°F. This has now received the approval of the Technical Committee on Research and will be incorporated in the new revision of Tentative Test Method, Arc-Lamp Test, which will appear in the next AATCC Technical Manual and Yearbook.

In exposures made under these new recommended test conditions we have encountered no appreciable difference in the character of fading between Fade-Ometer and sunlight tests and there has been considerable improvement in the rates of fading.

The degree of correlation obtained will of course depend upon how uniformly these new recommended test conditions are maintained in the Fade-Ometer. The standard commercial Model FDA-R Fade-Ometer in general use today is provided with controls and adjustments which permit operation over wide ranges of fading rates and temperatures.

The method of calibrating the Fade-Ometer in terms of standard fading hours has now been part of the Carbon-Arc-Lamp Test Method for a number of years and should be familiar to everyone conducting Fade-Ometer tests. While the light-sensitive paper distributed by the US National Bureau of Standards is recommended for calibrating the Fade-Ometer, the method does not preclude the use of the Blue Wool Standards for rating materials in the Fade-Ometer. In fact, the standard fading hour as measured by the light-sensitive paper is based on 1/20 of the amount of light dosage required to produce a just appreciable fade on AATCC Blue Wool Standard L-4.

BLACK-PANEL DEVICE FOR SPECIMEN TEMPERATURES——Temperature measurement by means of the black-panel thermometer unit is new in this test method, and a great many may not be familiar with it. This unit consists of a metal panel 2¾ x 5⅞", to which the stem of a bimetalic dial-type thermometer, is mechanically fastened to one face of the panel so that its sensitive portion is located in the center of and in contact with the panel. That side of the panel, including the stem of the thermometer, is then sprayed with two coats of a special black baking enamel. The unit is then mounted in a suitable holder similiar to the ordinary Fade-Ometer specimen holder, so that, when placed on the specimen rack the enameled face is towards the arc and in the same relative position as the face of the specimens. It thus revolves with the specimen rack and can be read through the window of the machine without opening the door.

The readings produced by it are the resultant of absorbed radiation less the heat removed by conduction, convection and radiation. It is thus subjected to the

same influences as the test specimens, and, while each test specimen will vary in its temperature according to its absorption characteristics, variations in black-panel temperatures in degrees Fahrenheit correlate remarkably well on a percentage basis with the variations in specimen temperatures. For example, a 10% rise in black-panel temperature will produce a 10% rise in the various specimen temperatures when both are measured in degrees Fahrenheit. The Fade-Ometer Black-Panel Thermometer Unit is compartively inexpensive and can be obtained from the same source of supply as the Fade-Ometer.

Black-panel temperature is immediately affected by changes in the intensity of radiation. It is also affected by both the temperature and volume of air passing over it and the specimens. In order to maintain a uniform black-panel temperature it will thus be necessary to keep the air filter in the base of the machine clean and unobstructed, as a reduction in the volume of air by a clogged filter will cause a rise in the black-panel temperature. If the wicks that cool the air are allowed to become hard and are not absorbent, a rise in the black-panel temperature will be observed. Unless the specimen rack is at all times completely filled with specimen holders, blank holders being used if specimens are not available, the proper flow of air over the test specimens and through the machine will not be obtained and the black-panel temperature readings will vary accordingly. The operators of many Fade-Ometers, when first using a Fade-Ometer Black-Panel Thermometer, have been quite surprised to learn that, because of some of the conditions just mentioned, they were actually obtaining black-panel temperatures of 200°F and over under what they believed to be the proper operating conditions of the machine.

In such cases, although they may have been obtaining a satisfactory number of standard fading hours as measured by the light-sensitive paper, they were doing so by accentuating the effect of temperature instead of having the proper balance between the effects of radiation and temperature. Under these conditions one can well imagine what happened to temperature-sensitive materials. Like that of the test specimens, the fading rate of the light-sensitive paper is thus affected by changes in both black-panel temperature and radiation intensity and can therefore be used under controlled black-panel temperatures as a basis for adjusting the arc lamp to the proper radiation intensity.

RELATIVE HUMIDITY AND FADING———Within the ranges obtained in the Fade-Ometer, relative humidity, as compared with temperature and radiation intensity, produces very little effect on the fading rate of the light-sensitive paper. This undoubtedly is due to the fact that exposure to radiation both raises the temperature and lowers the moisture content of the specimens, with relative humidity of the air around the specimen contributing little regain as compared with losses due to temperature rises.

ADJUSTING A FADE-OMETER——— If a Fade-Ometer is in good electrical and mechanical condition, the standard test condition, that a period of 20 standard fading hours is equivalent to 20 hours of exposure at a black-panel temperature not exceeding 165°F can be obtained by the following procedure of adjusting the Fade-Ometer:

1) Adjust the various arc-lamp controls for the normal radiation intensity, as will be explained later in detail.

2) With the machine in operation disregard the ambient temperature scale on the thermoregulator and turn the regulator down to the point where it will, by means of the blower, maintain a black-panel temperature of 160° to 165° F after the machine has been in operation and is completely warmed up.

3) Retrim the arc lamp with a new set of carbons and a clean globe. Insert a piece of light-sensitive paper and expose for 20 hours.

4) Compare the exposed light-sensitive paper with the control booklet or by photoelectric measurement and curve supplied, determine the number of standard fading hours produced in the 20-hour exposure.

5) If the fading produced is more than 20 standard fading hours, dercease the radiation intensity, and if less than 18 standard fading hours, increase the radiation intensity by adjustment of the arc-lamp controls.

6) Retrim the arc lamp and expose a new piece of light-sensitive paper for 20 hours. During the first few hours periodically check the black-panel thermometer and, if necessary, re-adjust the thermostat to maintain a black-panel temperature not in excess of 165° F.

7) Repeat the procedure of arc-lamp and black-panel-temperature adjustment, if necessary, until the Fade-Ometer is operating under the recommended conditions.

The Fade-Ometer Arc Lamp is provided with a number of manually operated controls and adjustments permitting the arc to be operated from various line voltages and at widely different radiation intensities.

For what we, for want of a better term, call "Normal Radiation Intensities" or for use as a starting point, adjust the arc lamp and its controls as follows:

1) Voltage-adjustment switch on control panel at position No. 1.

2) Check to make sure that there are three lead washers on the top of the dash pot of the arc lamp. The machine was shipped with three in place, and they should be replaced if they have been removed.

3) As per the instructions on the wiring diagram and inside the cover of the reactance transformer, connect the heavy lead marked "ADJ" to the properly numbered terminal for the actual line voltage at the machine. The reactance transformer is located in the black box in the section of the machine just below on the water pan.

To increase or decrease the radiation intensity and likewise the fading rate of the Fade-Ometer, employ as many of the following steps as are necessary in the order in which they are given. Use the maximum amount of adjustment provided by each step before proceeding to the next one. This information will also be found in the current *Fade-Ometer Operating Manual*, which is available upon request.

1) Voltage-adjustment switch. Four positions or steps are provided. Position No. 1 gives the lowest fading rate with consecutively numbered positions up to No. 4 providing increased fading rates.

2) Reactance transformer. Six terminals numbered from 1 to 6 are provided. Connect the heavy wire marked "ADJ" to the lower-numbered terminals to decrease the fading rate and to the higher-numbered terminals to increase the fading rate.

3) If the fading rate cannot be sufficiently reduced by using switch position no. 1 and reactance tap no. 1, increase the amount of resistance in the arc circuit by moving the clamp and lead completely to the end of the resistance coil, making sure of a good electrical connection. The resistance coil is located in the top portion of the machine. When shipped from our factory, 0.6 ohms of resistance in the resistance coil was not connected in the circuit.

4) Remove lead weights from on top of the dash pot of the arc lamp one at a time. This adjustment decreases the amperage of the arc lamp and should be utilized only after maximum adjustment has been made by steps 1, 2 and 3, which reduce or increase the arc voltage. For very high line voltages it may be desirable to install a step-down or bucking transformer in the line ahead of the Fade-Ometer.

The degree of the uniformity of test results in the Fade-Ometer is directly dependent upon how uniformly it is possible to maintain the various test conditions. Good housekeeping practice, which includes cleaning the air filter, keeping the wicks soft and absorbent, general cleaning of the machine, etc, will help considerably and can be directly controlled by the operator. Depending upon your local conditions, wicks and air filters may require cleaning as much as once a week and in extreme cases more often. The globe should be thoroughly cleaned at each change of carbons and should be free of chips or cracks.

LINE-VOLTAGE CONTROL——The uniformity of the radiation from the arc lamp is directly affected by the amount of variation in the line voltage. As a guide in determining how serious variations in line voltages are, under identical conditions of adjustment to the machine a 5-volt increase in the line voltage will in a 20-hour test produce an increase of about 2 standard fading hours. If line-voltage fluctuations of more than ±5 volts occur regularly but in no particular pattern or sequence, there may be a wide difference in results produced from day to day and the intensity of the arc lamp should be adjusted so that the average of the daily results are at the recommended conditions. Under these conditions of operation light-sensitive paper should be used daily and black-panel temperatures checked frequently.

If line-voltage fluctuations vary on a regular pattern, say high at night and low during the day, there should be little variation in results from day to day. If there is more than a 10-volt variation between the high and low, it would be wise to establish and utilize different adjustments to the lamp for each condition, for example, one setting during the day and another setting during the night.

Under the recommended radiation intensity required to produce 20 standard fading hours in 20 hours at a black-panel temperature not in excess of 165°F, it may, in extremely hot weather, be necessary to provide considerable ventilation around the outside of the machine. If this does not keep the black-panel temperature below 165°F, reduce the radiation intensity until 165° can be maintained. Under most conditions of room temperature the thermostat will adequately maintain the desired black-panel temperature, but, as major changes in the room temperature occur, it will probably be necessary to adjust the setting of the thermoregulator. Model FDA-R Fade-Ometers with serial numbers higher than FO-2276 are all equipped with an improved bearing-tube support, which increases the volume of air through the test chamber and provides for lower black-panel temperatures. This improved bearing-tube support is comparatively inexpensive and can be easily installed on all Model FDA-R Fade-Ometers having a serial number lower than FO-2276.

The above instructions are for model FDA-R alternating-current machines. Instructions for other types of machines will be supplied upon request.

When operated under the new recommended test conditions there should be good uniformity between day-to-day operation of the Fade-Ometer and between different Fade-Ometers, and the correlation between Fade-Ometer tests and the average of sunlight exposures for the majority of materials should be reasonably close.

IMPORTANT NOTICE

TO ALL MANUFACTURERS OF TEXTILE CHEMICAL SPECIALTIES

THE American Association of Textile Chemists and Colorists is now collecting material for the 1955 Edition of the *Technical Manual and Year Book*, and solicits your cooperation.

Please note that the list of Textile Chemical Specialties will be completely revised and brought up to date as in past years. All manufacturers and importers of textile chemical specialty products are therefore invited to submit data for the 1955 Edition, covering the following items only:

New data not previously listed
Correction of errors
Deletion of obsolete products

Cards should be filled out strictly in accordance with the directions accompanying this notice, and following the style of presentation employed in the 1954 Edition. To meet editorial schedules, all cards must be received by the undersigned before December 1, 1954.

WILLIAM H CADY, Editor,
Technical Manual and Year Book
127 Power Street,
Providence 6, Rhode Island

DIRECTIONS FOR FILLING OUT CARDS

In the compilation of this list of American sources of textile chemical specialties, products are selected primarily for their specific usefulness in textile processing, with the idea of presenting such information for the benefit of the textile chemist and colorist. However, because some textile chemicals, such as surface-active agents, are employed in other industries, nontextile uses are permitted to be indicated.

The reader should bear in mind that information from firms concerning uses and compositions is repeated without investigation and thus cannot be vouched for by the AATCC. On the other hand, because listings are made without charge for the benefit of our membership, it is nevertheless possible to edit all listings carefully and especially to eliminate exaggerated claims.

Information for new products should be tabulated on cards as described below. Where it is desired to make corrections in old entries in either the Index or the Alphabetical List, or to make deletions of old entries for withdrawn products from both of these, new cards should be prepared in the same manner, appropriately marked for correction or deletion, as described in the directions. Do not prepare cards for products already properly indexed and listed. Please note that we do not furnish printed forms; ordinary white ruled 3" x 5" index cards should be used.

I. KEY
- (a) On first line: firm abbreviation, limited to five letters.
- (b) On third line: firm name
- (c) On fourth and fifth lines: firm address

NOTE: Only *one* Key Card is necessary from each manufacturer

II. INDEX
- (a) On first line: enter one of the headings taken from the Index in previous editions, indicating the important use for the product being reported. If it has several uses, make out a separate card for each.
- (b) On third line, toward left: list the name of the product (only one) without any descriptive letters or numbers.
- (c) On third line, near right margin: list the abbreviation of the firm name, taken from the Key.
- (d) On bottom line: indicate whether the card is a New, Corrected, or Deleted Index Entry.

III. ALPHABETICAL LIST
- (a) On first line: abbreviation of firm name.
- (b) On third line: complete proprietary name of product, with descriptive letters or numbers; if name of product is a registered trade-mark, indicate the fact by an asterisk following the registered part of the name.
- (c) On fifth line: various uses.
- (d) On eighth line: chemical nature, *adequately* given.
- (e) On tenth line: patent number, if product is patented.
- (f) On bottom line: indicate whether the card is a New, Corrected, or Deleted List Entry.

In making out the cards it is necessary that you follow the instructions carefully; otherwise they may be returned for improvement. In particular, please avoid the use of capitals except for initial letters; be sure to report all products which have been discontinued; and please see that the "Chemical Nature" is properly recorded. We do not ask you to reveal secret information, but such descriptions as "amine compound" or "organic salt" are not considered adequate.

ACTIVITIES OF THE LOCAL SECTIONS

South Central

APPROXIMATELY 200 members and guests attended the two-day outing of the South Central Section June 4-5 at the Chattanooga Golf and Country Club, Chattanooga, Tenn. The annual golf tournament was held at the nearby Rivermont Golf and Country Club.

A buffet supper followed by bingo and dancing highlighted Friday night activities.

Saturday's activities included golfing, horseshoes, and fly casting, while Mrs Charles A Spratt's Ladies Committee sponsored a luncheon and bridge and canasta party. A cocktail party was held prior to the buffet supper and Saturday night banquet. Outing prizes were awarded following the banquet with Jack Anderson, Peerless Textiles, serving as master of ceremonies. The day's activities were concluded with dancing.

Dan Rion, Nopco Chemical Co, took low gross honors to win a second "leg" on the golf trophy. He won previously in 1952, and needs one more triumph to take permanent possession.

The Outing Committee consisted of A R Williams, Jr, Du Pont, *chairman;* Jack Anderson, Peerless Textiles, Inc, *vice chairman;* Paul O Anderson, Peerless Woolen Mills, *sectional chairman;* H P Loveless, Jr, Crystal Springs Bleachery, *finance;* Mrs Chas A Spratt, *ladies;* W D Blackmon, Jr, Sandoz Chemical Works Inc, *golf;* F L Kibler, Morningside Chemical Co, *entertainment;* Norman Price, Rockwood Mills, *men's sports;* Lowell Shive, Arnold, Hoffman & Co, Inc, *prizes;* C O Starnes, American Aniline Products, Inc, *registration;* and F E Cater, Ray Ser Dyeing Co, *publicity.*

(L to r): W D Blackmon, Sandoz Chemical Works Inc, golf chairman; Dan Rion, Nopco Chemical Co (winner of the golfing tournament); and Jack Anderson, Peerless Textiles (master of ceremonies)

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New York

JOHN H HENNESSEY, chairman of the New York Section, has announced the appointment of Donald E Marnon, American Aniline Products, Inc, as chairman of the technical program committee, and LeRoy R Hamilton, Textile Colors Division, Interchemical Corporation, as chairman of the registration committee.

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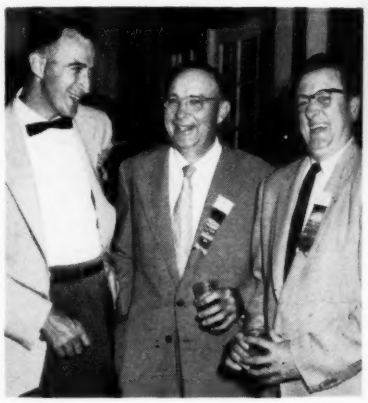

Horseshoe Pitching and Casting Winners ———(L to r): Bill Kennedy, Arnold, Hoffman & Co, Inc (horseshoes); Homer Whelchel, Central Franklin Process Co (casting); and C O Starnes, American Aniline Products, Inc (horseshoes)

(L to r): Mrs Jack Anderson; Samuel L Hayes, Ciba Co, Inc (AATCC vice president, Southern Region); Mrs John Sweitzer; W Bertolet, Laurel Soap Co; Jack Anderson, Peerless Textiles

Bridge and Canasta Prize Winners———(L to r): Mrs J M Patton, Mrs Glenn Bellamy, Mrs W K Newman, Mrs J C Whitt

Head table

RHODE ISLAND SECTION LADIES NITE • MAY 7, 1954 • PROVIDENCE, R I

(Photos by Jack Trezise)

Membership Applications

August 13, 1954

SENIOR

William J Hart—Technical director, Barbizon Corp, Scranton, Pa. Sponsors: B Uzenoff, T H Hart.

Charles M Lindsay, Jr—Salesman, Pittsburg Coke & Chemical, Fine Chem Div, Pittsburgh, Pa. Sponsors: R M Locke, T P Caldwell.

William G Quick—Vice-pres, Kingsboro Mills, Chattanooga, Tenn. Sponsors: L N Hurley, J O Sweitzer.

JUNIOR

Charles M Alberto—Chemist, plastics tech service, Dow Chemical Co, Midland, Mich. Sponsors: P A Gruber, W S Guerrant.

ASSOCIATE

Lorenzo J Cianciotto—Textile dyer, Amity Dye & Finishing Co, Atlas Terminal, Brooklyn, N Y.

Betty Livingstone—Chemist, Livingstone Coating Corp, Charlotte, N C.

CORPORATE

Southern States Chemical Co

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

James Balloch, Jr
Bertram Blechman
Richard W Boyden
Robert J Coskren
Earl H Hartgrove, Jr
Samuel J Martin, Jr
George E Pedersen
Stephen C Ruffenach
Ernest E St Louis, Jr
Carl E Schmidt
James K Skelly
Erwin P Stoetzner
Harry Wechsler

July 27, 1954

SENIOR

Edward J Baxter—Technical representative, E F Drew & Co, Inc, New York, N Y. Sponsors: I S Hurd, N A Johnson.

Albert R Buglione—Plant technical & practical supt, DeGise Finishing Co, Paterson, N J. Sponsors: C R Trommer, M L Blitz.

Bert L Channer—Technical supervisor, H Waterbury & Sons Co, Oriskany, N Y. Sponsors: L Shaftan, R H Quiri.

V Lindsay Chase—Director of research & development, Dispersions Dept, Interchemical Corp, Hawthorne, N J. Sponsors: H L Young, A Booth.

Robert E DeLapp—Salesman, Southern Sizing Co, East Point, Ga. Sponsors: H G Smith, C R Gill.

Charles B de Maya—Research manager, General Foods Corp, Hoboken, N J. Sponsors: R C Allison, D P Knowland.

Miroslav Engel—Dyer, South Pacific Textile Mills, Los Angeles, Calif. Sponsor: E B O Lindquist.

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CORPORATE

The Dobeckmun Co
Good Housekeeping Institute
Textile Service Co

APPLICATIONS FOR TRANSFER TO SENIOR MEMBERSHIP

James H Campbell
Robert F Goodwin
Salomon Heisler
William B Mason

NOTICE TO AUTHORS OF PAPERS

MANUSCRIPTS for the *Proceedings* and for other publications of the American Association of Textile Chemists and Colorists shall conform to the requirements and standards given in this *Notice.* Before publication, manuscripts for the *Proceedings* shall be approved by the Editor, not only for editorial correctness according to the standards of this *Notice,* but also for content of technical matter. In his work, the Editor may enlist the aid of anonymous reviewers who are selected for expert knowledge in particular fields.

It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

MANUSCRIPTS—Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5 x 11-inch white paper. In addition to the *original,* at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

ARTICLES APPEARING IN THE "PROCEEDINGS" IN RECENT ISSUES OF THE "AMERICAN DYESTUFF REPORTER" will be helpful to authors as models of form for the typing of manuscripts.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" of "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see third paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragrpah by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

LITERATURE REFERENCES AND FOOTNOTES—References to the literature and all footnotes (except those in tables) shall be numbered consecutively with underlined Arabic numerals in parentheses at the proper place in the text. Where a reference or footnote is to be used again, the original number is simply repeated; this obviates the necessity of repeating the footnote or reference at the bottom of the page. References to the literature shall conform to the universal usages followed by *Chemical Abstracts,* which include underlining of book and journal names to indicate italicization in printing.

The spelling and rules of punctuation followed in manuscripts shall be those found in the *Merriam-Webster New International Dictionary;* abbreviations and chemical formulas shall conform to *Chemical Abstracts.* Periods shall be used only at the end of sentences, not after abbreviations.

FIGURES AND GRAPHS—Figures and graphs should be black line drawings on white drawing paper. Photographic prints are acceptable, preferably glossy prints on double-weight paper. Duplicates should be available for dispatch to reviewers. Diagrams and graphs should preferably be designed in long form to cover one column of print but may be two columns wide or the width of a full page where necessary. In graphs the frame and actual curves should be inked more heavily than the co-ordinate lines, and these latter should not be too close together. Various styles of broken lines are sometimes desirable to distinguish curves. Experimental points should be given with small plane figures, such as circles, squares, diamonds or triangles. Numbers and legends on co-ordinate axes are to be lettered in the graph by the author. Numbers and titles of figures should be placed below the diagram or on the edge of the back. Each piece of illustration copy should bear on the margin or on the edge of the back the name of the author and the title of the paper.

Photographs of authors should be included with copy, to be run in conjunction with the paper. These must be on glossy stock, and should be large enough for proper reproduction.

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SYNOPSIS—A separately written synopsis of not over 200 words containing the gist of the subject matter must accompany every manuscript.

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TRADE-MARKS — As the AATCC wishes to co-operate in the protection of trade-marks, it is requested that, in the body of the article, trade-mark names be written with an initial capital letter. Courtesy demands that authors include competitive products as well as those of his firm. Many current trade-mark names are to be found in the *AATCC Technical Manual and Yearbook.*

• PATENT DIGEST •

PAUL WENGRAF

FLAME RESISTANCE BY TITANIUM SALTS—— Partially Dried and Alkalized G, 2, 03

U S Pat 2,668,780

(National Lead Co——Panik, Sullivan—— Feb 9, 1954)

Some of the standard flameproofing effects are not resistant to washing and separate from the fabrics in dust form. Some of the more durable flame-resistant finishes, such as chlorinated resins or waxes, substantially change the appearance of the textiles so treated.

Titanium chloride is an efficient flameproofing agent, but tendering of the fibers occurs because of the strong acid condition of the solutions. If the chlorine is partly substituted by oxidic groups (titanium oxychloride, optionally containing soluble phosphates) or by organic radicals (titanium chloride-acetate) this disadvantage is overcome; but the effects of these impregnation methods, which are covered by copending applications, are said to be impaired by repeated laundering.

The object of developing a more durable flame resistance with agents based on titanium compounds reportedly has been achieved by the following method: An aqueous solution of partially substituted chloride (as described above) is applied to the material to be flameproofed (textiles, paper, wood flour, etc) and partially dried. This step, which precedes alkalization to transform the chloride into oxychloride, is essential because immediate alkalization of the wet fabrics results in loss of titanium values and consequently, in less flame resistance. A weight pickup of 60-100% in impregnating is followed by exposure of the goods to the partial air-drying process at temperatures up to 60°C. Room temperature drying requires at least 45 minutes, but this time is reduced to 10 minutes at 60°C. The solution upon concentration forms a transparent gel; its weight is further reduced by evaporation to ½-1/3 of the pickup. The material is thereupon immersed in an alkaline bath at pH above 9, not over 12, and optionally mixed with soluble silicates to prevent afterglow. (Weak alkalis, such as sodium- or ammonium carbonate, are preferable.) The first impregnating solution may also contain some antimony, and in this event the usual 6-9% concentration of the partially substituted titanium chloride has to be increased.

Example: To impregnate cotton cloth a basic tetravalent titanium chloride solution containing 200 g antimony chloride, 60 g titanium and 84 g chloride (in addition to the chlorine bound to antimony) is used for 2.5 minutes. The fabric is squeezed to a pickup of 100%, partially dried at room temperature for 2 hours to reduce the liquid content to 50% of the original pickup, immersed for 5 minutes in a 20% NaOH solution keeping the pH at 9.5, wrung out and rinsed until the pH of the rinsing water is 8, and finally dried.

A table on comparative flame tests of partially dried and nonpredried samples shows that the results obtained according to the new method are by far superior and that any loss of titanium is substantially avoided whether mixtures of basic titanium chloride with antimony chloride or soluble phosphate or titanium chloride acetate solutions are applied.

References cited by the Patent Office: USPat 2,570,566 (Du Pont/1951) covers a flameproofing composition comprising a mixture of combined antimony and titanium compounds in a limited ratio of these components dissolved in hydrochloric acid [cf *Am Dyestuff Reptr 41*, 87 (1952)].

A history of flameproofing processes based on titanium compounds and mixtures thereof with other flameproofing ingredients, such as titanium chloride-acetate or mixtures of titanium-antimony compounds, and the results of a study on the effect of variables in binary salt mixtures are presented in article by Panik et al, Titanium Division, National Lead Co in *Am Dyestuff Reptr 39*, 509 (1950). The first patent in this field, Brit Pat 2703, appeared in 1900.

• Late German Patents

IT IS suggested that the following German patents, as listed in "Deutsches Patentblatt," would be of interest to our readers. Space limitations prohibit our reviewing them, but the complete original specifications may be obtained from the Sales Department, Deutsches Patentblatt, Gitschiner Str 97-103, Berlin S W 61, Germany. Translated abstracts may be obtained from Dr Paul Wengraf, 88-36 Elmhurst Ave, Elmhurst 73, N Y.

German Pat No.	*Date*	*Assignee and Title*
908,852	3/4/54	Farbwerke Hoechst — "Shrinkproofing wool"
909,566	3/11/54	Ciba A G — "Dyeing process with sparingly water-soluble metal-complex compounds of azodyes"
909,930	3/18/54	Gerstner — "Substitution products for glycerine in printing and dyeing processes"
910,774	3/18/54	Mitloedi-Raduner — "Production of washfast patterned translucent fabrics"
912,450	4/15/54	Farbenfabr Bayer — "Dyeing or printing acrylonitrile polymers with vat dyes"
912,451	4/15/54	Farbwerke Hoechst — "Fixing pigments on fibrous material"
912,925	4/22/54	Farbenfabr Bayer — "Sizing textile fibers"
913,285	4/29/54	Farbwerke Hoechst — "Dyeing with acid dyes and compositions thereof"
913,164	4/29/54	Farbenfabr Bayer — "Pigment printing or padding of textiles"
913,165	4/29/54	Farbwerke Hoechst — "Method of fixing pigments on textile goods"
911,724	4/8/54	Gerstner — "Surrogate for glycerine in dyeing and printing"
913,285	4/29/54	Farbwerke Hoechst — "Dyeing with acid dyes — dyestuff preparation"
913,164	4/29/54	Farbenfabr Bayer — "Pigment printing and padding on textiles"
913,165	4/29/54	Farbwerke Hoechst — "Fixing pigments on textile goods"
914,123	5/20/54	Farbwerke Hoechst — "Fixing pigments on textile goods"
914,491	5/26/54	Farbenfabr Bayer — "Vat dyeing or printing acrylonitrile polymers"
916,403	7/1/54	Phrix Werke — "Improving crease resistance of fibers and fabrics"
916,404	7/1/54	F C Jaeger — "Finishing effects on cellulosic fabrics, fast to washing, boiling, acids and alkalis"

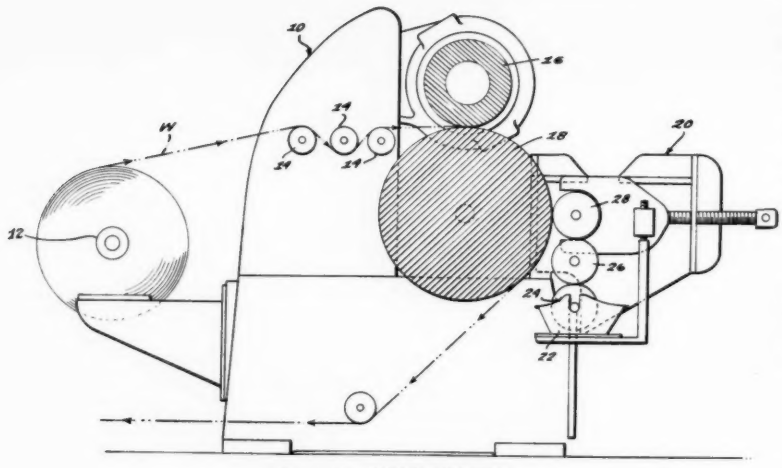


Figure 1—USP 2.667.426

COLORING EMBOSSED FABRICS G, 4

U S Pat 2,667,426

(Rock Hill Printing Co——Davis——

Jan 26, 1954)

This patent describes a method by which embossing and coloring of a fabric may be carried out in the same apparatus. The relief (embossed) portions may be colored, or alternatively, the ground may be colored while the embossed pattern is left colorless or colored in another shade.

According to Figure 1, the fabric (W) passes through tensioning bars (14), and then between a steel engraved embossing roll (16) and a backing roll (18). Upon leaving this calender the fabric is colored (tipped) by roll (28), the dye composition being fed from color pan (22) by means of furnisher and transfer rolls (24, 26).

A modification of this process calls for replacing the color application roll with an engraved roll in which the engraved pattern corresponds to the nonembossed portions; hence the ground appears colored while the relief portions remain uncolored.

In either case it is necessary to run the color application rolls at the same speed as the backing roll.

Among the references cited by the Patent Office:

USPat 2,392,594 (Royal Lace Paper Works/1946): producing embossed decorative material of two or more ply, at least one of which is transparent, and carrying a printed design positioned with the depressed portions on the contiguous ply.

USPat 1,939,081 (Prager/1933) protects the claims on an embossing calender to which is connected a smaller roll that carries interchangeable designs, especially for printing trademarks on paper.

USPat 1,742,363 (Prager Co-Matinek/1930): manufacturing embossed multi-colored wallpaper by applying bronze, ink or the like to the depressed parts and another color to the raised portions by means of an inking roller.

USPat 1,548,096 (D J Molley Corp/1925): coloring embossed sheets or other material by first spraying coloring liquid on the embossed goods, then printing the background, and finally fixing the colors with a drying lacquer.

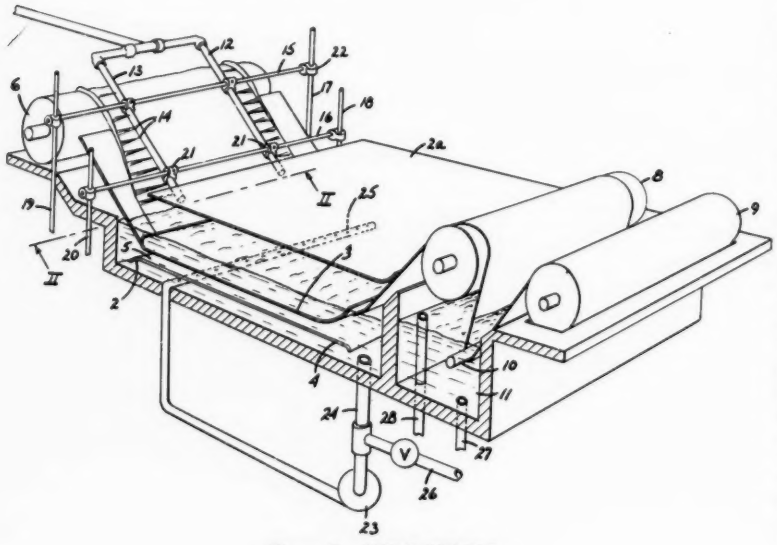


Figure 2—USP 2.669.502

PRESETTING AND DYEING TRICOT FABRICS—— Method and Apparatus G, 3

U S Pat 2,669,502

(Am Viscose Corp——Walmsley——

Feb 16, 1954)

In order to dye tricot fabrics evenly and overcome their tendency to curl at the edges in the dyebath, it has been customary to sew the edges together in tubular form and then remove the stitches after dyeing. These operations are time consuming and expensive. The tendency to curl is due to strains which develop in the knitting operation, and curling is inherent as long as these strains are not relaxed by a presetting process.

The object of the current invention is to simplify the dyeing procedure by combining it with the presetting operation, thus avoiding the aforementioned steps of sewing the edges together and subsequently removing the stitches. Dyeing can be carried out, according to the present method, at full open width, and the "curls" are removed just before the fabric enters the dyebath. Setting is effected simultaneously with the (continuous) dyeing process either by adding a partial solvent (sodium hydroxide for regenerated cellulose, alcohol or the like for acetate of cellulose) or by increasing the bath temperature (for other thermoplastic fibers). Quite generally in the latter event the bath temperature must be no higher than about 25°F below the melting point of the yarns. No tensioning of the fabrics is necessary during the entire operation.

It can be seen from Figure 2 that the fabric is drawn by rolls (6) to the dyeing vessel (2) and withdrawn at the same speed by roll (8). Before the fabric enters vessel (2) the formed curls are opened by air, which is blown in thin jets from perforated pipes (12 and 13). The fabric in flat, uncurled condition enters a space (5), termed a "tunnel," which is formed by upper plate (3) and lower plate (4). The goods are continuously led under plate (3) beneath the dyebath's surface. Upon leaving the bath the goods are rinsed in vessel (11), finally rolled up, and dried. Means for circulating and replenishing the dyebath and the rinsing liquid are provided as shown in the drawing.

(Concluded on Page 644)

• NEWS OF THE TRADE •

• Hilton-Davis Host to Southern Finishers at Greenville

ENTRANCE to Hilton-Davis Chemical Co's new dyestuff distribution center in Greenville, S C.

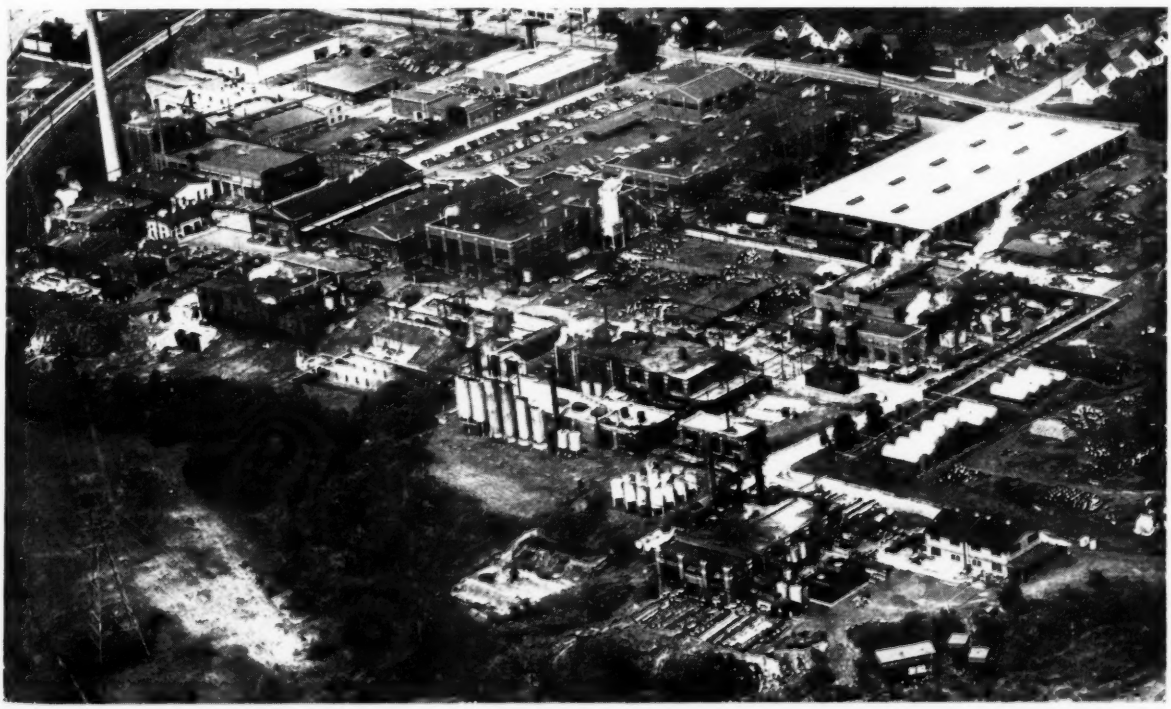
COLOR SERVICE LAB. Note new curing unit developed by Hilton-Davis (far end of laboratory).

Approximately 150 invited guests, representing Southern textile wet-processing firms, met at Greenville, S C, last month to view Hilton-Davis' newly opened service laboratory and distribution center in that city. After an inspection of the new 7,000-sq ft center, the visitors sat down to a buffet dinner, which was followed by a motion picture presented by Nelson S Knaggs, Hilton-Davis' vice president in charge of sales and renowned explorer.

The Hilton-Davis Chemical Co, a Division of Sterling Drug Inc, maintains extensive manufacturing facilities in Cincinnati, Ohio. The nucleus of their new operation in Greenville is a modern laboratory and textile service center, expressly designed to help solve Southern mill problems relating to dyestuffs. In addition to general offices in the building, the branch contains the service laboratory and facilities for storing, mixing, shipping and receiving various types of dyestuffs.

Described as a "vital" installation is a spacious, air-conditioned vault for storing heat-sensitive salts. Mr Knaggs points out that the latter permits "mint-fresh" delivery of these fast-color salts to Southern mills.

It is pointed out that approximately $250,000 worth of stock will be carried in the new warehouse at all times, sufficient to meet customer demands quickly. It is claimed that most orders can be filled overnight, and many within a few hours



Aerial view of The Hilton-Davis Chemical Company Division at 2235 Langdon Farm Road, Cincinnati, Ohio

AIR-CONDITIONED VAULT for storing heat-sensitive fast-color salts.

WAREHOUSE for storing nontemperature-sensitive products at Hilton-Davis' new dyestuff distribution center in Greenville. About one-half of the available 3,000 sq ft is shown in this photo.

of receipt. Available are the Spectrolenes, Spectrosols, naphthols, fast bases, fast color salts, Hiltone pigment and printing and padding colors, optical brighteners and acid and basic dyes.

Facilities for laboratory testing are modern and complete. In addition to a new company-developed curing unit, the laboratory includes equipment for color matching, color padding, printing, crocking, fading, washing, acid aging, and color mixing. Mr Knaggs estimates that nearly all service requests can be handled at Greenville. Only problems relating to new dye syntheses will be referred to Cincinnati.

S Y Stribling, manager of the Greenville branch, is aided in sales and technical service by William Pearson, with headquarters in Decatur, Ga, and John Darsey, with headquarters in Greensboro. This team serves customers in the Carolinas, Georgia, Tennessee and Virginia.

* * *

Following by one week the "open house" at Greenville, Hilton-Davis opened its doors at Providence, R I, to New England finishers. The Providence venture represents a transfer from Boston to a point which the Company feels is more centrally located in relation to that segment of the industry it serves.

• 3rd Chemical Finishing Conference, NCC

The National Cotton Council's third annual chemical finishing conference, at which latest developments in improving cotton products through chemistry will be discussed, will be held in Washington October 7 and 8.

William D Appel, chief of the National Bureau of Standards' Textile Section, will be general chairman of the two-day meeting, which is expected to attract about 200 industry leaders.

Presiding over the four meetings to be held during the conference will be Mr Appel, Henry A Rutherford, North Carolina State College; R Hobart Souther, Cone Mills Corporation; and Milton Harris, Harris Research Laboratories.

• LTI to Dedicate Cumnock Hall on Sept 28

Cumnock Hall, the new auditorium-administration building of the Lowell Technological Institute, will be dedicated at a special fall convocation on Sept 28 at the LTI campus in Lowell, Mass. As part of the ceremonies vice president of the United States Richard M Nixon will be awarded the honorary degree of doctor of science.

The occasion will commemorate the 120th anniversary of the birth of Alexander Goodlet Cumnock, in whose memory the new building was erected. Mr Cumnock, an outstanding leader of New England industry, was the first president of the LTI board of trustees.

B W Hayward

• Hayward Elected to PTI Presidency

The election of Bertrand W Hayward as president of the Philadelphia Textile Institute was announced on August 23 by Rinaldo A Lukens, Continental Mills, Inc, chairman of the board of trustees.

Mr Hayward has served as administrative head of the school since 1947 as director while Mr Lukens was president. Upon the resignation of Theodore B Hayward, Swift & Company, chairman of the board of trustées since 1949 and an active board member since 1934, Mr Lukens accepted the post as chairman of the board of trustees and the former director was elected president. Theodore B Hayward will continue as a trustee, member of the Executive Committee and chairman of the Building Committee.

Bertrand Hayward was graduated from Colby College in 1933. He received his Masters Degree from Columbia University and pursued doctorate study at Harvard University Graduate School of Education.

Other newly elected officers include: *1st vice president*—Fred C Scholler, Scholler Brothers, Inc; *2nd vice president*—W Lyle Holmes, Jr, Archibald Holmes and Sons; and *secretary and treasurer*—Julius Zieget.

Mr Lukens also announced the election of John G Schoepf, Asten Hill Manufacturing Co, Frank P Zurn, and Mr Hayward as new members of the board of trustees.

Appointments of standing committees of the board of trustees for the fiscal year 1954-55 are as follows:

EXECUTIVE COMMITTEE

Fred C Scholler, Scholler Brothers, Inc; Theodore B Hayward, Swift and Company; Everett L Kent, Kent Manu acturing Co; Edward H Rakestraw, Hyde Rakestraw Co; Lindsey H Mason, Philadelphia Dye Works; Russell C Osborne, R C Osborne and Co; Elsie M Murphy, S Stroock and Co; Robert A Smith, American Viscose Corp; W Lyle Holmes, Jr, Archibald Holmes & Sons; Frank P Zurn; Ralph Whitaker, Fred Whitaker & Sons; and John G Schoepf, Asten Hill Manufacturing Co

FINANCE COMMITTEE

Morris R Brownell, Philadelphia National Bank; John G Schoepf, Asten Hill Manufacturing Co; Fred C Scholler, Schoiler Brothers, Inc; Joseph Schmitz, Jr, Universal Dye Works, Inc; Frederic H Barth, Industrial Rubber Co

BUILDING COMMITTEE

Theodore B Hayward, Swift and Co; Edward H Rakestraw, Hyde Rakestraw Co; Robert A Smith, American Viscose Corp; Fred C Scholler, Scholler Brothers, Inc; Ralph Whitaker, Fred Whitaker & Sons; Morris R Brownell, Philadelphia National Bank; Lindsey H Mason, Philadelphia Dye Works; Thomas M Hyndman

INSURANCE COMMITTEE

Russell C Osborne, R C Osborne and Co; Everett L Kent, Kent Manufacturing Co; and W Lyle Holmes Jr, Archibald Holmes and Sons

HONORARY DEGREES COMMITTEE

Frank P Zurn; Elsie M Murphy, S Stroock and Co, Inc; Martha Jungerman, PTI; William H Hughes, PTI; and Leon P Brick, Onyx Oil & Chemical Co

• GAF Revises Plans for Chlorine-Caustic Plant

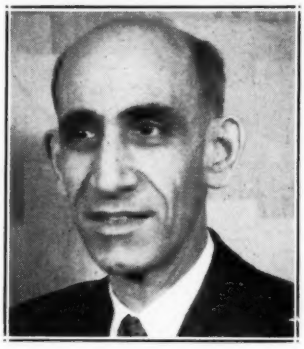
General Aniline & Film Corporation last month announced revised plans for its chlorine-caustic plant calling for expansion of the rated capacity initially scheduled at 26 tons of chlorine per day to a daily output of 50 tons. The new facilities will be erected on a site adjoining the Company's installation at Linden, N J, and will involve an expenditure of nearly $5,000,000.

Announcement of plans for the construction of the new plant was first made on April 21st of this year. The project represents a major step in the vertical integration of the Company's Dyestuff and Chemical Division, a management objective for many years.

John C Franklin, GAF vice president—operations, said the virtual doubling of the capacity is required by the further anticipated increase in the need for chlorine at its Linden and Rensselaer, N Y, plants. Because of the expected large volume use by General Aniline, the Company will not offer any of the products of this facility for general use.

The new installation has been designed to be expandable permitting further expansion as needs arise. The unit is being designed and constructed by the Blaw-Knox Company and is expected to be in operation by the fall of 1955. Mathieson type cells will be used.

OBITUARY



Isaac H Godlove

ISAAC H GODLOVE, 62, one of the nation's leading color physicists, died last month in Easton, Pa, after a career of 40 years. He had served General Aniline & Film Corp since 1953 as senior physicist.

Dr Godlove was a trustee for the Munsell Color Foundation, served as chairman of AATCC's Committee on Color, and was elected national chairman of the Inter-Society Color Council in 1948.

Born in St Louis, Mo, on June 13, 1892, Dr Godlove received his BS and MA degrees from Washington University. He received his doctorate from the University of Illinois in 1926.

After a period of years on the faculties of Missouri State Normal School, and later the University of Oklahoma, Dr Godlove became research director for the Munsell Color Co in 1926. From 1932 to 1935 he was a chemist and physicist for Du Pont.

Surviving are his widow, Margaret, and a son, Terry.

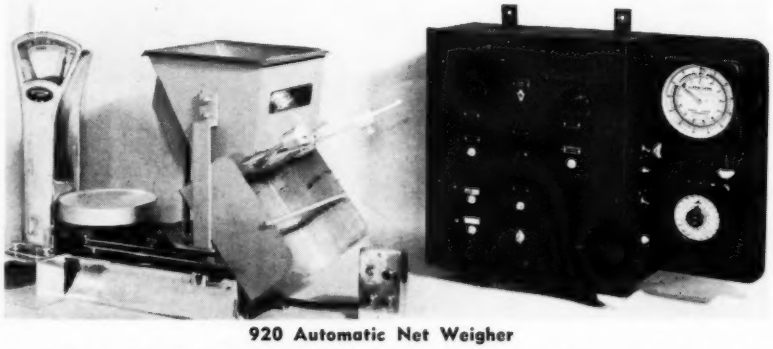
Frederic L Goodall

FREDERIC L GOODALL, president of the Society of Dyers and Colourists, died in June at the age of 52.

He received his BSc from Leeds University in 1922 and his MSc the following year. In 1923 he accepted a position as chemist with C R Roberts & Co, Ltd, then Yorkshire agents for Geigy. Later, on the formation of the Geigy Colour Co Ltd, he became chief chemist and subsequently Yorkshire area manager. In 1948 he became sales director of the Geigy Co Ltd in Manchester and was made joint managing director in 1953.

He became a junior member of the Society in 1920, was a member of its council for 16 years and a vice president from 1950 to 1953. At various times he served on many of the Society's committees including: finance, charter, publications, fastness tests, West Riding section, and diplomas. He represented the Society in other organizations, including the International Federation of Textile Chemists and Colourists, and was made a Fellow of the Society in April of 1954. He was elected president in 1953.

NEW PRODUCTS AND DEVELOPMENTS



920 Automatic Net Weigher

• Automatic Net Weigher for Continuous Controlled Weighing

A new automatic net-weighing machine with load discharge timer and counter for all types of free-flowing materials has been introduced by the Exact Weight Scale Company, Columbus, Ohio.

The net weigher is fed the free-flowing commodity by a vibratory feeder until the predetermined amount is in the weigh bucket. The bucket will not discharge its contents, however, until a preset time interval has elapsed. A counter unit records the number of weighments and shuts off the operation when a preset number of loads have been made. A pushbutton control panel also permits manual control when desired.

The unit provides visual indication of every weighment. Accuracy, which remains unaffected by any normal machinery vibration, is said to be extremely high. The scale is precision-built, with one-to-one ratio dynamically balanced lever. Control rheostats provide infinite adjustment of both fast and slow rate of feed to weight bucket.

Unit capacities are available from a few ounces up to twenty-five pounds, with dial and beam calibrations in either metric or avoirdupois.

• Plastic-Impregnated Label for Lab Use

A label designed to withstand the rigors of laboratory use is currently offered by Avery Adhesive Label Corp, Monrovia, Calif.

Developed by Avery's Research Department, the Kum-Kleen Label utilizes a plastic-impregnated stock that is said to be impervious to oils, greases, fresh water or salt water, and is resistant to soap, acids, alkalies and other chemicals.

It is claimed that this new label will withstand over 200°F for two hours—or it may be frozen without damaging the label. According to the manufacturer they are self-adhesive, are easily removed, are safe to use, the no-licking feature eliminates any toxic poisoning hazards, and they offer an ideal marking surface upon which it is easy to type, stamp or write. The line consists of three sizes, suitable for use on test tubes, microscopic slides, for flasks, beakers, retorts, etc.

• GE Line of Recording Controllers

New process instruments including potentiometric and a-c bridge recorders and recording controllers made by the General Electric Company's Meter and Instrument Department are designed for continuous measurement and control uninterrupted by periodic standardization. Foremost among the new features are a magnetic standard in the potentiometric system and a bridge-balancing unit in the a-c bridge system.

Both models are available with either electric or pneumatic control, and are equipped with a centerless pointer that simplifies chart changing and leaves practically all of the chart exposed to view for easy reading.

G-E engineers point out that the design of the new line reduces maintenance and component replacement costs considerably. The new magnetic standard reportedly eliminates dry cells, slidewires, and many moving parts found in conventional potentiometric instruments.

Heart of the a-c bridge system, the new bridge-balancing unit supplies power to the bridge and provides a means for rebalancing it. In cases where the variable under measurement is temperature, the circuit is unbalanced by changes in the resistance bulb. Balancing is achieved by a servo motor which repositions the balancing unit's rotor.

Other advantages of the equipment include plug-in components, antibacklash gearing, internal illumination, and an integral pen-inkwell assembly designed for automatic realignment.

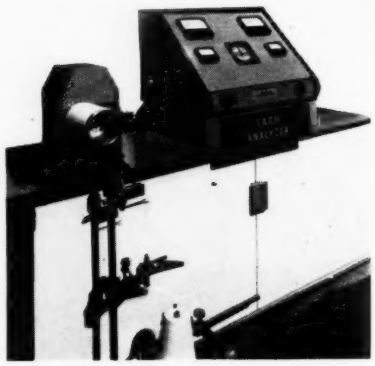
Net weight of the products varies from 75 to 95 pounds according to control form and measuring system. The units utilize a 120-volt, 60-cycle power supply. The potentiometer has a power consumption of 65 watts; the a-c bridge, 40 watts.

• Automatic Yarn Analyzer

An automatic high-speed yarn analyzer developed recently by the Fielden Instrument Division of Robertshaw-Fulton Controls Company, 2920 North Fourth St, Philadelphia 33, Pa, contains an electronic computer that presents immediately on "memory dials" four separate measures of yarn quality essential to high-grade production.

The analyzer gives the following information:

1) total mean linear unevenness percent (LUE%) over a given length of yarn; 2) long-wave mean linear unevenness percent integrated over the same length of yarn with drafting waves suppressed; 3) total number of slubs or thick places in the length examined (the slub counter adds thicknesses in the yarn greater than the percentage of the mean



Fielden Automatic Yarn Analyzer

weight of the yarn indicated on the slub control); and 4) comparison of the actual count as a percentage variation from a known sample to which the instrument has been calibrated, or the percentage variation in count between successive samples.

The new device requires threading with a 200-foot yarn sample and starting. The machine stops itself and the analyses are given on "memory dials" which retain reading until the winding guide is reset. It reportedly adjusts automatically to any count of yarn within the range of the electrode used, although in no way does it supplant yarn evenness recorders which are employed for detailed analysis of yarn faults.

• Union Dyeing Procedure for Dynel-Wool Blends

A union dyeing procedure which is said to permit piece dyeing of blends of Dynel and wool and blends of Dynel, wool, and rayon was announced recently by T A Feild, Jr, head of the Development Service Laboratory, Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

By one of the new techniques, metallized dyestuffs reportedly can be applied to obtain good unions with fastness to crocking and the No. 2 wool wash test. The colored fabrics also are said to show very good light fastness.

Important to the achievement of a successful union with these metallized colors are bath temperature, the use of a suitable retarding agent for the wool and control of the pH of the bath. At a low dyebath temperature, without a retarding agent, wool has a far greater affinity for the dyestuffs than Dynel. However, it is claimed that, with proper elevation of temperature and with the retarding agent present, the dyestuffs selected have an affinity for Dynel comparable to that for wool.

The best union dyeings reportedly are achieved when the initial pH of the dyebath is raised to slightly above 7. The presence of 2.0% Peregal TW in a slightly alkaline bath is said to retard the dyeing of the wool to a point where the Dynel can be dyed very effectively. Of several compounds tested for controlling the pH, diammonium phosphate is said to have produced the brighter or clearer colors. Ammonium carbonate, ammonium sulfate and ammonia also produced good color build-up on the Dynel, it is reported.

Carbide recommends that the dyeings, started at room temperature, be carried out by raising the dyebath temperature to a boil and holding at the boil for 60 minutes. Slow cooling results in less wrinkle formation. After dyeing, the fabrics are scoured, rinsed and dried.

Mill experience reportedly has shown that normal processing or finishing procedures used for woolen and worsted fabrics may also be used for the blended fabric. Occasionally it is possible to reduce either the length or severity of the decating operation on blended fabrics and still acquire the proper finish and hand of the goods.

The following amounts of chemicals are recommended by Carbide for a 30 to 1 bath ratio:

2.0% Peregal TW;
2.0% diammonium phosphate;
0.4% to 2.0% of a selected metallized dye.

Metallized dyestuffs that are said to have given good results include Irgalan Brown 3BL, 2RL, 2GL, Orange RL, Olive BGL and Gray BL; Capracyl Blue G, Black N and Brown RD; Nyalan Olive G, Red G, Red B, Brown 2G, Black B, Yellow 2R and Navy Blue B; Cibalan Yellow 2BRL and Brown 2GL; and Vialon Fast Red B, Red G, Yellow R, Copper R, Black R and Brown GR. It is stated that a dye carrier may be used to increase the pickup of the meallized color by the Dynel when very dark shades are desired.

For dyeings of Dynel-wool blended fabrics, which will be carbonized after dyeing, it is suggested that the dye manufacturers recommendations for fastness to carbonizing be consulted. It is pointed out that the same metallized colors which show good affinity for Dynel also have made possible the union dyeing of blends containing acetate and Dynel.

Several large scale dyeings reportedly have been made, producing outerwear fabrics of good fastness properties, by utilizing this procedure in combination with direct or aftertreated direct colors on blended fabrics of Dynel, rayon and wool. In these instances, the colors were applied to the Dynel and wool at the boil and when the desired shade was achieved, the bath temperature was lowered and the rayon dyed to shade at the reduced temperature. Resin finishing of these fabrics with CRF resins was done using procedures and curing temperatures that would normally be used for all-rayon fabrics.

NAMES IN THE NEWS

Jacoby

Sanborn

Gower

Paden

Scalera

Parker

HENRY X deREDON has been named manager of the New England Branch, Ciba Co, Inc, succeeding RAYMOND W JACOBY, who on July 31st retired from the position. Mr Jacoby will continue to serve as technical consultant with the company.

Mr deRedon, who previously was assistant New England Branch manager, joined Ciba's New York Office in 1935, and for the next 13 years was engaged in both technical and administrative service. He has been active in the New England territory since 1948.

Mr Jacoby has been with Ciba for the past 18 years. For many years he has been an active member of the American Association of Textile Chemists and Colorists, serving at different times as Sectional Chairman, national Councilor, and, in 1952, as vice president. He currently is serving as chairman of the Executive Committee for the Perkin Centennial in 1956, and has been nominated for the AATCC presidency, elections for which will be held in November. In 1951, in recognition of his contributions in the field of textile chemistry, Mr Jacoby was awarded that organization's highest award, the Olney Medal.

CHARLES F SANBORN, manager of Wyandotte Chemicals Corporation's M A Division Market Research Department, has been promoted to senior sales representative in the Company's Eastern District Office. He moved to the New York headquarters of the district on September 1st.

Mr Sanborn has been with Wyandotte for 13 years, 9 of them doing market research. He has been department manager since 1951.

ALBERT H GOWER has been appointed general sales manager of Warwick Chemical Company, Division of Sun Chemical Corp, Long Island City, N Y.

For the past ten years, Mr Gower has handled various sales functions in the Industrial Chemicals Division of American Cyanamid Co. In his new position, he will direct the sales activities of each of the firm's product groups, including textile chemicals, pigment printing colors, industrial surfactants, etc.

JOHN H HAGEN has been appointed director of industrial relations for the Brown Instruments Division of Minneapolis-Honeywell Regulator Company.

Mr Hagen, 21-year man with the company, was formerly special assistant to the divisional president, HENRY F DEVER.

LLOYD OSIPOW, director, Surface Chemistry Dept, Foster D Snell, Inc, will conduct a course in surface chemistry at the Polytechnic Institute of Brooklyn beginning the week of Sept 27. Registration of the course, No. 1750, will take place Sept 20-25.

New appointments within the American Cyanamid Company organization include the following:

Research Division — Bound Brook, N J, Laboratories — JOSEPH H PADEN, research chemist at the Stamford Research Laboratories since 1942, has been named director of the Bound Brook Laboratories. MARIO SCALERA, assistant director of research in charge of dyes, pigments and intermediate research at Bound Brook since 1948, has been named director of research.

New Product Development Dept — ELWOOD I CLAPP, JR, formerly a member of the Market Research Department, has replaced J C PULLMAN as assistant manager of the New Product Development Department. Dr Pullman was recently named manager of technical service of the Organic Chemical Division's Petrochemicals Department.

Research Division — Pearl River, N Y, Laboratories — ROBERT P PARKER has been named to the newly created post of director of research of the Pearl River Laboratories. Dr Parker was formerly director of research at the Bound Brook Laboratories, a post he held since January of this year.

JOHN C BALL, JR, has joined the Polychemicals Division, West Virginia Pulp and Paper Company as a technical representative. He was formerly with E I du Pont de Nemours & Co, Inc, Savannah River project.

Winners of ten Commonwealth of Massachusetts Scholarships have been announced by President Martin J Lydon of Lowell Technological Institute. These scholarships were established a year ago by the Massachusetts State Legislature for deserving high school graduates who are residents of the Commonwealth. Under the terms of the award each of the ten winners will receive $250 during each of the four years he is enrolled at the Institute, as long as a good scholastic record is maintained.

The scholarship recipients include: ROBERT E CAREY, PETER E DUBEY, RICHARD F HOBSON, MARTIN J KILLOURIE, JR, THOMAS J McCARRON, HUBERT J McCOY, JR, PAUL R ROUSSEL, PHILIP J SCHLUETER, HERBERT W VARLEY, and PAUL F WHITE.

ROBERT C PUTNAM has joined the product research staff of the United States Testing Company, Hoboken, N J.

Dr Putnam was formerly project engineer with the United Shoe Machinery Corporation in Beverly, Massachusetts.

Dr Putnam's assignment results from the Company's increased activity in leather and tannin research, and related research activities within the fur, textile and coatings industries.

WILLIAM L GOMORY, JR, has been appointed purchasing agent for Claremont Pigment Dispersion Corp, Brooklyn, N Y.

Knaggs

Burch

Snyder

Rieger

Smith

Klee

NELSON S KNAGGS, vice president — sales, Hilton-Davis Chemical Co, a Division of Sterling Drug, Inc, Cincinnati, will leave New York on Sept 25 for trip that will include stops at Paris, Cairo, Bombay, Bangkok, Hong Kong, and Tokyo. His return is scheduled for Nov 6.

At Bombay, Mr Knaggs will confer with J H DOSHI, managing director of Amritlal & Co, Ltd. Both men are directors of Amar-Dye Chem Ltd, a new company which will manufacture dyestuffs in India.

J W BURCH and J A SNYDER recently joined the Textile Finishes Department of Procter & Gamble, calling on accounts in the East.

Mr Burch represents P & G in areas of Pennsylvania, Maryland, New Jersey, Delaware, and Virginia. Mr Snyder is servicing P & G accounts in sections of New York and New Jersey.

D S HAMBY, associate professor in the School of Textiles, N C State College, was elected chairman of the Textile Division, American Society for Quality Control at the recent annual meeting of ASQC in St Louis. Professor Hamby succeeds GARDNER HAILES, director of quality control, Avondale Mills of Alabama, as division chairman.

Other officers elected were: *vice-chairman* — EDWARD S RUDNICK, Wamsutta Mills; *secretary* — JOHN H REYNOLDS, Celanese Corp of America; *treasurer* — THOMAS BAINBRIDGE, Tennessee Eastman Corp; councilor, Central District — JAMES LITTLE, Anderson, Clayton and Co, Inc; councilor, Middle Atlantic District — FURMAN B MARTIN, JR, Springs Cotton Mills; councilor, New England District —ROBERT R JONES, Bigelow-Sanford Carpet Co; councilor, Northern District — F ALEXANDER GNAEDINGER, Canadian Celanese, Ltd.

The Textile Division, ASQC, is an industry-wide organization with 250 members from all segments of the textile industry. Its objective is the promotion, institution, and maintenance of statistical quality-control techniques in textile manufacturing.

E I BIRNBAUM, treasurer of Hart Products Company of Canada, served as Canadian representative at the World Congress on Surface-Active Agents, which was held Aug 30-Sept 3 at Paris, France.

MORRIS J WARREN and RALPH A PENTZ, JR, have been named to the Sales and Technical Departments of American Alcolac Corp, Baltimore, Md.

Mr Warren will be active in Alcolac's Sales and Application Research. He was previously with the U S Department of Agriculture as a laboratory technician and the U S Army Chemical Corps as a research laboratory technician.

Mr Pentz will be connected with Alcolac's Technical and Customer Service Department. He was a laboratory technician for Davison Chemical Company three years before joining Alcolac.

GEORGE RIEGER has been named by Diamond Alkali Company, Cleveland, O, to lead and coordinate market research activities of its recently-formed Commercial Development Department.

Having already assumed his new duties, Mr Rieger also will be engaged in process evaluation studies, economic analyses, and related departmental functions involved in determining the commercial feasibility of new products and the scope of their market potentials.

Mr Rieger comes to the Diamond organization from Hercules Powder Company, where he has been assistant manager of its sales research division since February, 1953.

The appointment of RAY E SMITH to the Technical Service Department of its Textile Division has been announced by Onyx Oil & Chemical Co, Jersey City, N J.

Mr Smith will be primarily concerned with the sales department of the new Onyx stabilizing agent "CET." He was formerly associated as chief chemist with the Aquex Development and Sales Corporation, Whippany, N J. Prior to that, he was employed in the Textile Research Department of the American Viscose Corporation in Marcus Hook, Pa.

HAROLD J KLEE has been appointed manager of the newly-organized Central Sales Division, Stauffer Chemical Company, with district sales offices in Chicago and Houston. Mr Klee was formerly manager of the Chicago sales district and will continue to make his headquarters in that city.

J H BEGLEY, formerly assistant manager, has been appointed manager of the Chicago sales district.

Three changes in the Industrial Chemicals sales organization of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation, have been announced.

R L DUNCAN who was district sales manager of the Detroit district, has been appointed Eastern Division sales manager with headquarters in New York. He will supervise the activities of the six district sales offices located in Albany, Baltimore, Boston, Newark, New York, and Philadelphia.

J B HARLOW, former Atlanta district sales manager, has been named district sales manager of the Atlanta district.

G E BERNARD has been appointed district sales manager of the Atlanta District. He had been assistant district sales manager of the San Francisco District.

EMERY I VALKO, director of research, Onyx Oil and Chemical Co, Jersey City, N J, and Onyx International, is completing an extended tour of Europe, where he visited scientific and industrial organizations in Germany, France, Switzerland, Belgium and England and conferred with representatives of Onyx International.

While in France, Dr Valko addressed the First World Congress on Surface-Active Agents, which was held in Paris Aug 30-Sept 3.

RICHARD D FINE, former group leader of the textile chemicals section, Central Research Laboratory, Atlas Powder Co, will head a newly formed sales development group within Atlas' Chemicals Department. The new staff, composed of experienced textile chemists, will be available to all Atlas branch office sales representatives in servicing fiber producers and manufacturers of textile chemical specialties. It will also expedite the handling of research and application problems referred to the Company's Central Research Laboratory in Wilmington.

Assisting Mr Fine in servicing basic fiber producers will be EDWARD M SIMON, JR, former supervisor of research and development work on rayon tire yarn and cord for American Viscose Corp.

Working with specialty formulators will be ARTHUR N GREEN, who has been serving in the textile chemicals section, and RUSSELL F CRAWFORD, JR, who recently joined Atlas after serving as assistant head of the textile chemicals division of American Viscose.

BYRON N BAER, who was previously assistant section leader in Avisco's yarn finish section, succeeds Mr Fine as group leader of textile chemicals research. He will be assisted by EDWIN C SHERBURNE, a recent graduate of Lowell Technological Institute.

RAYMOND J CAREY, northeast regional sales representative of the dyestuff and chemical division of General Aniline & Film Corporation, New York, has been promoted from Major to Lieutenant Colonel in the U S Army Reserve.

Food Machinery & Chemical Corp, New York, has announced four important moves involving sales personnel of the Westvaco Chlor-Alkali and Westvaco Mineral Products Divisions.

ARTHUR F SMITH has been appointed manager of sales, and PRESTON F TINSLEY, assistant manager of sales in the Westvaco Chlor-Alkali Division, which will henceforth sell the chlorine, caustic soda, caustic potash, soda ash, carbon bisulfide, carbon tetrachloride and grain fumigants manufactured at its South Charleston, W Va, and Westvaco, Wyo, plants.

DONALD C OSKIN has been appoined manager of sales, and JAMES R HARRIS, assistant manager of sales for the Westvaco Mineral Products Division, which will henceforth sell the sodium phosphates, phosphoric acid, barium compounds and magnesium chemicals manufactured at its Carteret, N J, Lawrence, Kans, Pocatello, Ida, Newark, Calif, and Modesto, Calif, plants.

All of the aforementioned products were previously sold by the Westvaco Chemical Division, which has been inactivated.

The following key research personnel have been added to the staff of the Department of Textile Research, School of Textiles, North Carolina State College: WILLIAM T WATERS, research assistant professor; ANNE P SMITH, research instructor; ROSA D KIRBY, research instructor; and ROMIE M TURNER, research draftsman.

Abstracts——

(Continued from Page 616)

for wearing with evening dress clothes. They are very wear-resistant, and are easy to wash and dry.

The crimped-filament type are a recent development. The yarn is highly elastic, and it is not necessary to produce the socks in more than three sizes to meet all foot measurements. The fabric is resilient and cushions the foot well.

Socks made from 100 percent nylon staple can be made in varying weights. They are resilient, warm, and absorbent. Under normal conditions of wear they can well be described as indestructible. They are completely stable dimensionally, are easy to wash and dry, and will not felt.—WHC.

Methods of Fiber Identification

H Sieber, *Dyer* 110, 901-7, Dec 11, 1953.

The identification of textiles is a subject with which the dyeing and dry cleaning trades are more concerned nowadays than in pre-war years. Nowadays they have to deal not only with textiles made of wool, cotton and rayon but also with a variety of new textile fibers.

The properties of the various fibers demand individual attention, and only the safe, certain and quick identification of all the old and new fibers that the dry cleaner is likely to meet will protect him from mistakes, losses, and disappointment of customers. Many of the new synthetic fibers require special safeguards when dyeing, laundering and finishing. The cleaning of synthetic fibers in various solvents and subsequent spotting with conventional chemicals need special care and attention.

The author reviews the old basic methods of identification and gives information on "new, simple, foolproof and practical methods." He furnishes useful data on the peculiarities of the individual fibers which have to be considered by the dry cleaner.

He states that very often it will be sufficient to get a rough idea of the composition of the material, i e, whether it consists of cellulose, protein, or synthetics. The burning test in conjunction with the acetone test is still the simplest and most useful utility test, which anyone can be taught to use.

Following the burning test, the author suggests a solubility test in acetone and hot and cold glacial acetic acid, to distinguish between acetate, nylon, and the acrylic fibers.

The other identification methods are numerous, often complicated and time-consuming. Four main methods, one of which is completely new in its form, stand out as being the most practicable. These are:

(1) The microscope.

(2) The staining test with Shirlastain A and C

(3) The Neocarmine W staining test.

(4) The "Zillo-Test-S" for the identification of synthetic fibers.

Of the staining techniques, the Shirlastains are useful in the identification of textile materials, particularly of those made of cellulose or protein fibers. Only a few synthetic fibers are stained.

Another very useful staining solution is Neocarmine W. The shades obtained on the various fibers are similar to those for Shirlastain A. The main adidtional advantage of this stain lie in the extended range of its application (i e, it will identify the synthetic fibers Orlon and Terylene), and in its use for the detection of strong oxidizing damage to cellulose material.

The application of these various stains is described by the author. He also mentions the use of Oxycarmine for the detection of oxycellulose on cotton fibers.

Finally, he describes the application of the "Zillo-Test-S," which is a commercial kit for the identification of the various synthetic fibers. This test depends on the solubility of the different fibers in a series of organic solvents.—WHC.

New Process for Pad-dyeing Synthetics with Acetate Dyes

J K Holliday, *Modern Textiles* 35, 59-60, April, 1954.

Extensive laboratory experiments corroborated by plant trials and commercial runs show that for dyeing various types of synthetics a new pad-dyeing process has several definite advantages over the older conventional methods of dyeing in jigs or boxes. It is also said to be an

improvement over the pad-dyeing processes that have been developed in the past.

To date, the process has been employed successfully, according to the author, on the following specific types of materials: acetate piece goods, nylon tubular webbing, acetate and rayon piece goods, acetate and cotton belting, Dynel tow, and rubber-backed fabrics containing nylon, rayon and cotton.

Advantages of the new pad-dyeing operation include excellent penetration of webbing and other tightly woven fabrics, elimination of shaded selvages, easier control of shades in cross-dyeing, and saving in dyeing time, steam and chemicals. On some fabrics the method results in better fastness to crocking of dark shades. There is no tailing off of shades. Many fabrics can be dyed in the greige, eliminating the boil-off.

The new method consists essentially of passing the material to be dyed through a pad liquor containing a highly dispersed acetate dye or dyes, selected penetrants, a suitable swelling agent, a gum, and water; then developing in a jig box, or other suitable equipment. A carrier, such as phenyl methyl carbinol, may be added if the liquor is to be used for dyeing Dynel. In some instances a wetting agent such as Igepon may be included. The process can be adapted also for producing either solid shades or cross-dyed effects on fabrics containing blends or mixtures of acetate, nylon, and other synthetics with cellulosic fibers.

The author gives a list of suitable acetate dyes for this method, and full details of typical formulas and the dyeing procedure. He states that padding, developing and drying can be carried on continuously in a range consisting of a 2- or 3-roll padder, an open-width washer, and dry cans. Fabrics containing Dynel require special treatment.

The author states that he has applied for a patent on his process.—WHC.

Successful Bleaching of Type 670 Nylon

B K Easton, *Modern Textiles* 35, 66, 68, April, 1954.

Practical experience has shown that the bleaching procedures for Type 200 nylon are less satisfactory for bleaching Type 670. Although the general principle of bleach-bath make-up and application is the same, modifications of the formula are necessary for successful bleaching.

The use of peracetic acid 40% as a textile bleaching agent is of particular interest to mills handling nylon fabrics. This product gives very satisfactory bleaching effects in a simple application. Superior whites are said to be obtained.

The author presents typical bleaching procedures as used in the mill, with information on recommended materials of construction for bleaching equipment, situable bleach-bath stabilizers, the make-up of the bath, temperature, etc.

The bleaching may be carried out on jigs, dye becks, slack-type washers, padders, or rotary-type machines. Stainless steel and wood are recommended materials, being inert to peracetic acid. Metals such as iron, brass, lead, copper, etc, must not be used in contact with the cloth, the bleach bath, or the concentrated peracetic acid.

As this acid has a characteristic odor, especially at high temperatures, good ventilation of the bleach house is desirable.—WHC.

Patent Digest——

(Concluded from Page 634)

Example: All-cellulose acetate fabric may be dyed at 200-205°F within 5 seconds in a 0.1% solution of Cellitone Yellow 4RL to which 0.08% of Igepon T and 0.0125% of sodium hexametaphosphate (Calgon) are added. By reason of the presetting effect obtained in the dyebath the strains in the fabric are relieved and the fabrics no longer curl.

Although this example refers to cellulose acetate fibers the process may be applied to other fabrics which tend to curl and particularly to other thermoplastic materials, such as nylon, Orlon or Dacron.

Among the references cited by the Patent Office:

USPat 2,613,521-22 (Am Viscose Corp/1952) describes a means for uncurling the edges of a tricot fabric by passing it through a swelling or softening liquid in relaxed condition, but avoiding the point where the fibers become tacky.

USPat 2,402,621 (Un Merchants & Mfrs/1946): uncurling tricot fabrics by tensioning the wetted goods to the full width, thereby flattening the edges, and at the same time blowing air in the direction of the rolled-up edges [cf *Am Dyestuff Reptr* 35, 721 (1946)].

USPat 2,365,931 (Du Pont/1944): setting nylon by pressing the fabrics uniformly against a surface heated to at least 190°C and generally to a temperature 5-25°C lower than the fusion point of the nylon substance.

GENERAL CALENDAR

AMERICAN CHEMICAL SOCIETY
National Chemical Exposition—Oct 12-15, Chicago, Ill.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Southern Textile Conference—Nov 4-5, North Carolina State College, Raleigh, N C.

AMERICAN SOCIETY FOR QUALITY CONTROL
Annual meeting, Textile Div—Jan 27-29, Clemson College School of Textiles.

DELTA KAPPA PHI FRATERNITY
1955 Annual Convention—April 29-30, Lowell, Mass.

DEUTSCHE GESELLSCHAFT FUR CHEMISCHES APPARATEWESEN
Achema XI—May 14-22, Frankfurt am Main, Germany.

DRYSALTERS CLUB OF NEW ENGLAND
Oct 29, Jan 24, April 29 (Hotel Vendome, Boston, Mass); June 24 (Outing—Wachusett Country Club, W Boylston, Mass.)

THE FIBER SOCIETY
Fall Meeting—Sept 13-14, McGill University, Montreal, Canada.
Spring Meeting—May 4-5, 1955, Alabama Polytechnic Institute, Auburn, Alabama.
Fall Meeting—Sept 8-9, 1955, Massachusetts Institute of Technology, Cambridge, Mass.

INTERNATIONAL CONGRESS OF INDUSTRIAL CHEMISTRY
27th Congress—Sept 11-19, Brussels, Belgium.

INTERNATIONAL TEXTILE EXHIBITION
2nd Exhibition—June 25-July 10, 1955, Brussels, Belgium.

INTERNATIONAL WOOL TEXTILE RESEARCH CONFERENCE
September, 1955—Sydney, Melbourne, and Geelong, Australia.

NATIONAL ASSOCIATION OF HOSIERY MANUFACTURERS, KNITTED OUTERWEAR ASSOCIATION, THE UNDERWEAR INSTITUTE
42nd Knitting Arts Exhibition—April 25-29, Convention Hall, Atlantic City, N J.

NATIONAL COTTON COUNCIL OF AMERICA
1954 Chemical Finishing Conference—Oct 7-8, Hotel Statler, Washington, D C.
Annual Meeting—Jan 31-Feb 1, Hotel Shamrock, Houston, Tex.
Cotton Research Clinic—Feb 16-18, Pinehurst, N C.

NATIONAL INSTITUTE OF DRYCLEANING
4th Educational Conference—Dec 5-10, Silver Spring, Md.

NEW YORK PIGMENT CLUB
Oct 14, Nov 10, Dec 9, Jan 15.

NORTH CAROLINA TEXTILE MANUFACTURERS ASSOCIATION
48th Annual Meeting—Oct 14-15, The Carolina, Pinehurst, N C.

SOUTHERN TEXTILE EXPOSITION
October 4-9 (Textile Hall, Greenville, S C).

TEXTILE RESEARCH INSTITUTE
25th Annual Meeting—March 10-11, Hotel Commodore, New York, N Y.

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